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POLLUTION OF THE INTERSTATE WATERS OF THE MAHONING RIVER - AND ITS TRIBUTARIES. PROCEEDINGS OF CONFERENCE HELD AT YOUNGSTOWN, OHIO ON FEBRUARY 16-17, 1965. VOLUME 2

Public Health Service
Washington, D. C.

17 February 1965

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Conference
in the matter of Pollution of the Interstate Waters of the [illegible] River and its Tributaries

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UNITED STATES PUBLIC HEALTH SERVICE

DIVISION OF WATER SUPPLY AND POLLUTION CONTROL

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In re:                            :
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ENFORCEMENT CONFERENCE ON THE     :
                                  :
     MAHONING RIVER               :
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Voyager Motor Inn,
129 Market Street,
Youngstown, Ohio,
Wednesday, February 17, 1965

MURRAY STEIN, Chairman.

CONFEREES:

Leonard Weakley - Ohio River Valley Water Sanitation Commission
Edward Cleary - Ohio River Valley Water Sanitation Commission
H. W. Poston - United States Department of Health, Education, and Welfare
Richard Boardman - Pennsylvania Department of Health
Dr. E. W. Arnold - Ohio Department of Health

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PROCEEDINGS

CHAIRMAN STEIN: May we reconvene. We have some communications here which we have been asked to put in and without objection of the conferees, we will place them in. One is by Verne Harris, Acting Chairman of the Pollution Committee, League of Ohio Sportsmen, with a brief history of the League of Ohio Sportsmen.

Without objection, we will put that in the record.

(The communication referred to is as follows):

Conference on the Mahoning River.

I, Verne L. Harris, of 635 National City Bank Building, Cleveland, Ohio, have been appointed to take the place of W. Harold Yost who passed away in January of this year.

Harold Yost has been chairman of the pollution committee for the past 25 years and did a wonderful job working with all of the Ohio state departments.

He has printed a report every year for the League of Ohio Sportsmen and I am including the last year's report with this statement.

The League of Ohio Sportsmen has been in existence since 1908 and one of our principal aims is to have good clean water in the State of Ohio. I am also including in my report a brief history of the League of Ohio Sportsmen.

The League has for a number of years made a special study of strip mining and the disposal of the mine runoff water.

This I understand is one of the principal objects of this meeting and the League has some ideas on its control.

The League is having a special program on strip mining Friday afternoon and evening, February 19, 1965, at our annual convention at Columbus, Ohio and you are all welcome to attend.

Respectfully submitted, Verne L. Harris, Acting Chairman Pollution Committee, League of Ohio Sportsmen.

- - -

CHAIRMAN STEIN: And the other is a statement of Mr. Dale Whitesell of the Ohio Department of Natural Resources, Division of Wildlife, and he was here yesterday and he left this statement to go in.

Without objection, we will put that in.

(The statement referred to is as follows):

Mahoning River Basin Hearing Statement of the Ohio Department of Natural Resources, Division of Wildlife, Youngstown, Ohio, February 16, 1965.

The duty of the Ohio Department of Natural Resources, Division of Wildlife, in cases of pollution killed fish is set by law. All the wild animals in Ohio not legally confined are held in trust by the state for the benefit of the people, by virtue of Section 1531.02 Revised Code. Section 1531.04 places the responsibility upon the Divsion of Wildlife through the chief for enforcing by proper legal action or proceeding the laws of the state protecting these wild animals.

Starting in May 1964, a review was held of the Division's success in pollution fish kill cases. It was determined that improvements were in order. The pollution investigation procedure which had been in effect for about 15 years was completely reworked. A written procedure was developed in standardizing the investigative effort at a quality level; the collection and preservation of legal evidence was particularly strengthened.

Since that time there have been 64 instances wherein the Division has investigated wild animals killed by water pollution. The estimated total animals killed number more than 9,800,000 and consist mainly of fish. About 46,000 of these wild animals were killed in the Mahoning basin; 43 in Greenwalt Ditch on June 18 (insufficient evidence) and 46,170 in the West Branch of the Mahoning River on August 13 (evidence being evaluated).

Trained law enforcement agents were added to the investigative team which has consisted of the local game protector and a fisheries biologist. Photographs are taken, witnesses interviewed and those in charge of the apparent source of pollution are contacted. A case file is prepared. The biologist also prepares a biological interpretation based upon water tests conducted at the site, laboratory tests of water samples, kill counts and fish autopsies. This is then related to data in "Water Quality Criteria" published by the California State Water Quality Control Board.

The State Department of Health is contacted at the outset of each investigation and is provided copies of initial reports. That Department conducts the laboratory analysis of water samples and provides a copy of the analysis as well as an interpretative statement of the findings.

Evidence is evaluated by staff personnel and, when determined sufficient to proceed in civil court, a claim is presented to those causing the kill.

Here is a summary of the statewide results since last May compared with those of the preceding 17 years.

Comparison with Preceding 17 Years

	since May 1964	1947 thru 1963
Investigations resulting in damage claims	28	44
Investigations inconclusive	26	685
Investigations under way	11	
Investigation results under evaluation	4	
Total wild animal kills investigated	64	729
Total investigation where a kill did not occur	9	582
Total of all investigations	73	1,311
Number of damage claims collected	5	25
Total amount of damage claims collected	$27,133.58	$52,137.35

The law provides that the people of Ohio are to be compensated for the loss of their property whether it be 1 or 100,000 wild animals. In the past, damage claims were not made when only a few fish were killed by pollution. However, at the same time a licensed sport fisherman taking one fish illegally was arrested and subjected to a fine of from $15 to $200 plus court costs. Therefore, damage claims supported by sound evidence are being pursued in all cases of pollution killed fish regardless of the quantity involved.

Statewide fish killing pollution came in many forms: treated sewage, untreated sewage, acid coal mine waters, oil, meat packing plant wastes, food processing wastes, farm silo drainage, livestock wastes, pesticides, herbicides, road paving materials, industrial materials or wastes including cyanide, ammonia, various acids, phenol, heavy metals and other compounds.

Now let us briefly review the instances of fish kills occurring in the Mahoning Basin since 1950.

Pollution Source	1950-54 Kills	1955-59 Kills	1960-64 Kills
Industrial	10	4	3
Sanitary	4	1	3
Strip Mine	4	3	3
Sand & Gravel	0	1	1

Industrial pollution cases involving fish kills declined 70 percent from 1950 to 1964. Sanitary pollution cases declined 25 percent, with a sharp reduction from 1950 to 1959. Strip mining pollution indicated a slightly lesser decline.

In closing I will now briefly review the status of the public fishery in this basin. The Mahoning River below Leavittsburg has been polluted sufficiently to eliminate it from any of Ohio's past fisheries management programs. The present water conditions from Newton Falls to Leavittsburg are better than they were during the industrial boom and the last war. The large amount of dilution water from the reservoirs on the tributaries has also contributed to the improvement.

The fish pollution in the upper end of the Mahoning River and the accompanying recreation have improved in recent years. White bass and walleye populations have been developed as the result of the introduction of these species into Lake Milton and Berlin Reservoir. Berlin is one of the best inland walleye lakes in Ohio. The movement of these fish downstream over the spillways at Berlin and Milton has resulted in good fishing downstream. Deer Creek Reservoir, upstream from Berlin, has been developed by the Division for muskellunge fishing. A fine population is present but fishermen have not yet taken full advantage of it. Lake Park in Alliance was purchased, developed, and opened to public use by the Division. Its fish population has recently been rehabilitated and good bass angling is expected to result from this action. The walleye, perch, and crappie angling in Mosquito Creek Reservoir and in Mosquito Creek below is a result of fish management work by the Division.

Finally, I must say, water pollution is recognized as a problem throughout the nation, a problem of the States and their individual citizens. The need for improving the quality of our surface water was the theme of National Wildlife Week several years ago and is being repeated again this year.

The Ohio Division of Wildlife is not a pollution abatement agency. However, the authority which the law provides for pollution work by this agency is being used in a full and effective sense.

CHAIRMAN STEIN: What is your judgment on these brief histories? Shall we just take that as an exhibit or print it in the record?

MR. CLEARY: As you see fit.

CHAIRMAN STEIN: Well, let's see if this brief history will be made an exhibit and we will include the statement of the League of Ohio Sportsmen for the record. At this point, we would like to call on Pennsylvania for a continuation of the statement and Mr. Richard Boardman, as you know, is with us as conferee from Pennsylvania.

Before we start, though, I would like to give you our tentative schedule for the day and we hope we will be able to adhere to this depending on the length of the presentation. I think Mr. Boardman of Pennsylvania has one person to make a statement. Then we will have the Federal Government presentation. Other Federal agencies other than the Department of HEW will be asked to make statements first, then the HEW statement will follow.

This should take us, if we are lucky, hopefully until about one o'clock.

DR. ARNOLD: Ohio still has four participants. We yielded yesterday so Pennsylvania could get out.

CHAIRMAN STEIN: I stand corrected.

Ohio still has four participants. Do you have any notion how long this will take?

DR. ARNOLD: I think not too long.

CHAIRMAN STEIN: Well, in that case, we would hope for at least 1:30. Then the conferees will adjourn and we will make an announcement at that time as to when we may come back. If at all possible, I think this is the consensus that we would try to be completed today and hopefully we can conclude the conference. But I think this will have to wait on developments and statements.

Now, may we have Mr. Boardman?

MR. BOARDMAN: Our final invitee is Mr. Samuel McBride who is Manager of the Beaver Falls Water Authority. Mr. McBride is representing the Pennsylvania section of the American Waterworks Association.

MR. McBRIDE: Before I start, there seemed to be a lot of discussion yesterday as to who called this conference and why. I want to assure you that Beaver Falls Municipal Authority has not put in a complaint. The appearance of the writer at this conference was requested by the Ohio River Sanitation Commission and the Pennsylvania section of the American Waterworks Association. The writer also welcomes the opportunity to appear and present these statements on behalf of Beaver Falls Municipal Authority, the only public water supply purveyor, obtaining its source of supply from the Beaver River.

Description and History.

The Beaver Falls Municipal Authority provides water service to approximately 15,600 customers comprising a population of about 65,000 persons in the City of Beaver Falls, the Boroughs of Fallston, Eastvale, Freedom, East Rochester, New Brighton, Patterson Heights, Rochester, West Mayfield, West Bridgewater, Big Beaver and six surrounding townships, all in Beaver County, Pennsylvania. The district that served the Water Authority is roughly 30 miles down the Ohio River from Pittsburgh and about midway between Pittsburgh and Youngstown, Ohio.

In 1902 the Beaver Valley Water Company was formed and consolidated the several water companies in the Beaver Valley. All of these waterworks were interconnected and served by the new company which operated two pumping and purification plants, one in Eastvale, across the Beaver River from Beaver Falls, and the other in New Brighton. In 1940 the Beaver Falls Municipal Authority was created and it purchased the Beaver Valley Water Company.

Description of Existing Plant Facilities.

The Authority operates the two plants, whose source of supply is the Beaver River which is formed by the Mahoning River and the Shenango River and whose drainage area is slightly in excess of 3,000 square miles.

The Eastvale plant, enlarged in 1957 by the construction of a 4.0 mg settling and filtering facility, brought the filtration capacity to 10.0 mgd. The treatment consists of coagulation, primary and secondary sedimentation, filtration and chlorination. The finished water is pumped to the distribution system and storage facilities by hydraulic electric or diesel powered pumps.

The New Brighton plant which has a filtering capacity of approximately 3.5 mgd. also contains facilities for the same type of treatment as practiced at Eastvale. An interconnecting line and pumping facilities make it possible to pump approximately 210 mgd from the Eastvale plant to the New Brighton system.

Early History of Taste and Odor Problems.

The writer has been acquainted with the operation of the water system since 1937 when employed as chemist of the Shenango Valley Water Company of Sharon, Pennsylvania. Both water companies were owned by the same holding company. The late Mr. E. C. Goehring, chemical engineer for the Beaver Valley Water Company, was consultant to the Shenango Valley Water Company.

The early history of taste and odor problems in the Beaver River can best be told by including in this statment excerpts from a paper presented by Mr. Goehring at a meeting of the Pennsylvania Water Works Operators Association June 4, 1942, entitled "Taste and Odor Control for Phenols with Activated Carbon."

The Beaver Falls Municipal Authority, formerly the Beaver Valley Water Company, started using activated carbon in October 1931. Inasmuch as it was still in an experimental stage at that time, the normal dosages recommended as being sufficient to control ordinary taste and odor conditions, as given by the manufacturers, were applied. While some benefits were obtained from its use with relatively small dosages, it was indicated that with our water considerably larger dosages would have to be applied in order to get a complete, or at least a satisfactory, removal of the taste and odor producing materials which are found in the Beaver River, particularly phenols.

The first several years of its use must be considered as experimental, during which time a gradual increase in dosages was applied with proportionately better results in the finished quality of the water. During this experimental period, the industrial activity in the Youngstown area, on the Mahoning River, was relatively low. It wasn't until 1937, and thereafter, that, with the increase in industrial activity, a greater concentration of taste producing substances, particularly phenols, made it necessary to increase carbon dosages.

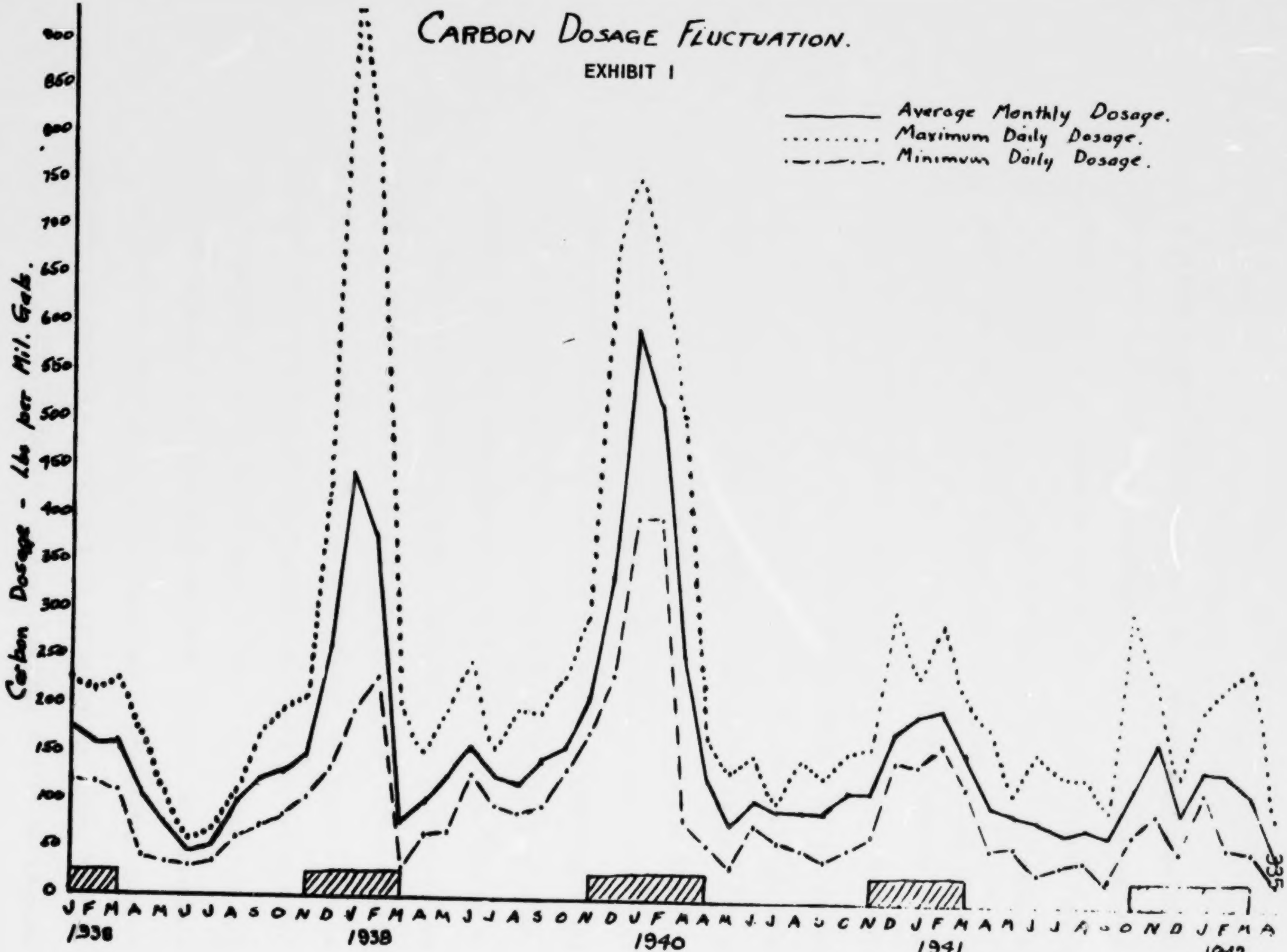
In order to graphically indicate the carbon requirements and the fluctuation in carbon dosages at our plant, the curve called "Carbon Dosage Fluctuation" was plotted for the years 1938 through April 1942. This curve shows the average monthly dosages, as well as the maximum and minimum daily dosage for that particular month. This curve clearly shows that during the winter months, starting in November and running through March, as being our most critical period in which the higher dosages are used. It is during these months that we are affected by the phenolic wastes from the Youngstown steel area, which is introduced by way of the Mahoning River into the Beaver. The highest dosage on record is that of 948 pounds per million gallons for a single day.

Because of the increased cost involved in the use of such high carbon dosages, considerable experimentation was carried out during the years starting April 1938 to March 1940, to determine whether or not some other method of purification might not be available to remove the taste and odors, not only more effectively but also at a more reasonable cost. Mr. John R. Baylis, the well known water consultant, was employed during that period of time and laid out experimental work which was carried on for a considerable period of time. Some of the taste and odor removal processes tried were: aeration, superchlorination, potassium permanganate, bleaching clay, ozone, and storage, as well as a thorough study on activated carbon requirements. The most effective method found for taste and odor removal, especially for phenols, was activated carbon.

The effect of the temperature of the raw water on the carbon dosage is graphically shown on the curve on which is plotted the four-year average monthly carbon dosage for the years 1938, 1939, 1940 and 1941, along with the temperature of the water for an average year. These two curves show very plainly that whenever the water drops to about 40 degrees Fahrenheit the carbon dosage increases very markedly and, conversely, when the temperature increases above 40 degrees Fahrenheit, the carbon dosage drops very rapidly. The period coincides with the beforementioned period, November to March, when phenolic wastes are present at our intakes. This phenomenon has been observed for the past 17 years and is a good index of when we can expect our troubles. The explanation for this has been offered by the fact that with temperatures above 40 degrees, the biological activity in the stream removes the phenolic compounds or reduces them to non-taste and non-odor producing substances. Our most critical periods are during the time when the river is frozen over, and even the maximum amounts of carbon applied have proven uneffective in completely removing the phenols.

CARBON DOSAGE FLUCTUATION.

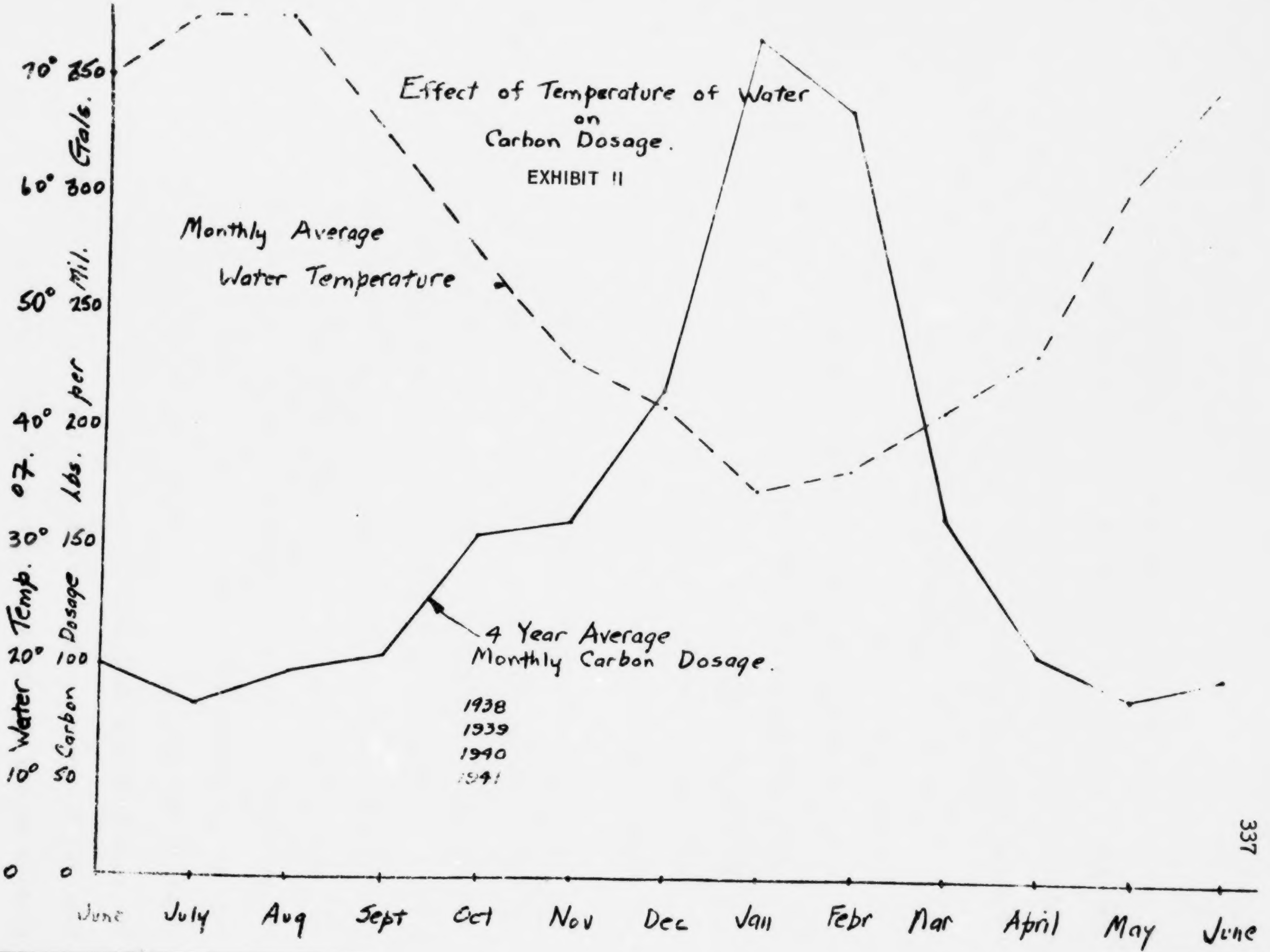
EXHIBIT I



After several years' study of our problem, in the report made by Mr. John R. Baylis, he makes the following statement concerning the pollution of the Mahoning River as follows:

> "No water, regardless of its use, should be so highly polluted. If the pollution is lessened, water of good quality can be supplied without difficulty in the treatment all of the time. This is now being done but sometimes at a cost more than any waterworks should be required to expend for water treatment."

While this conclusion is quite a criticism on the type of water with which we have to start, some recognition must be given to the State Health authorities for the remarkable work which has been carried out during recent years. Along with the lessening of the wastes in the Mahoning River and the increased flow of water from the Pymatuning Reservoir, a beneficial effect has been felt in the Beaver Valley plants. This is effectively shown in the decrease in the carbon dosage required in the year 1941 and 1942 when it would have been expected that due to increased industrial activity, a more critical problem should have been present under the conditions formerly found. We are very much encouraged in this decrease



Effect of Temperature of Water
on
Carbon Dosage.
EXHIBIT 11

and hope that with continued efforts being applied, not only by our aggressive State Health Department but also by the continuation of Interstate and Federal regulations, that our problems at the Beaver Valley plants will decrease to the extent that our carbon dosages will more nearly approach normal. So states Mr. Goehring in his 1942 paper. I will just break here for just a minute.

When I was asked to appear here, I tried to find a common element whereby I could compare the waters previously and at the present time and due to various methods of treatment used and types of treatment, changes, I have come up with a cost of purification analysis which I think is an indication as to the condition of the river.

From the above report and an analysis of the records with regards to the cost of chemical treatment, Figure 3, entitled "Chemical Treatment Costs - Eastvale Plant" shows graphically the treatment costs from 1927 through 1964. All chemicals are priced at the 1964 prices.

Assuming that the same quality of water has been produced at Beaver Falls, the curve indicates that the cost of treatment has decreased considerably from 1940 to 1954. The cost from a high of $25.59 per million gallons to a low of $7.43 per million gallons. From 1954 to 1957 the treatment cost was stabilized at about $8.28

per million gallons. From 1958 through 1964 the costs of treatment have been increasing.

The methods of treatment used at the Eastvale plant over the years are as follows:

1927 to 1931 - Aluminum sulphate or alum for coagulation, lime for pH correction and chlorine for disinfection.

1931-1949 - Same as above with the addition of activated carbon for taste and odor control and a small amount of ammonia for chloramine treatment, also for taste and odor treatment.

(See next page.)

Chemical Treatment Costs

Eastvale Plant

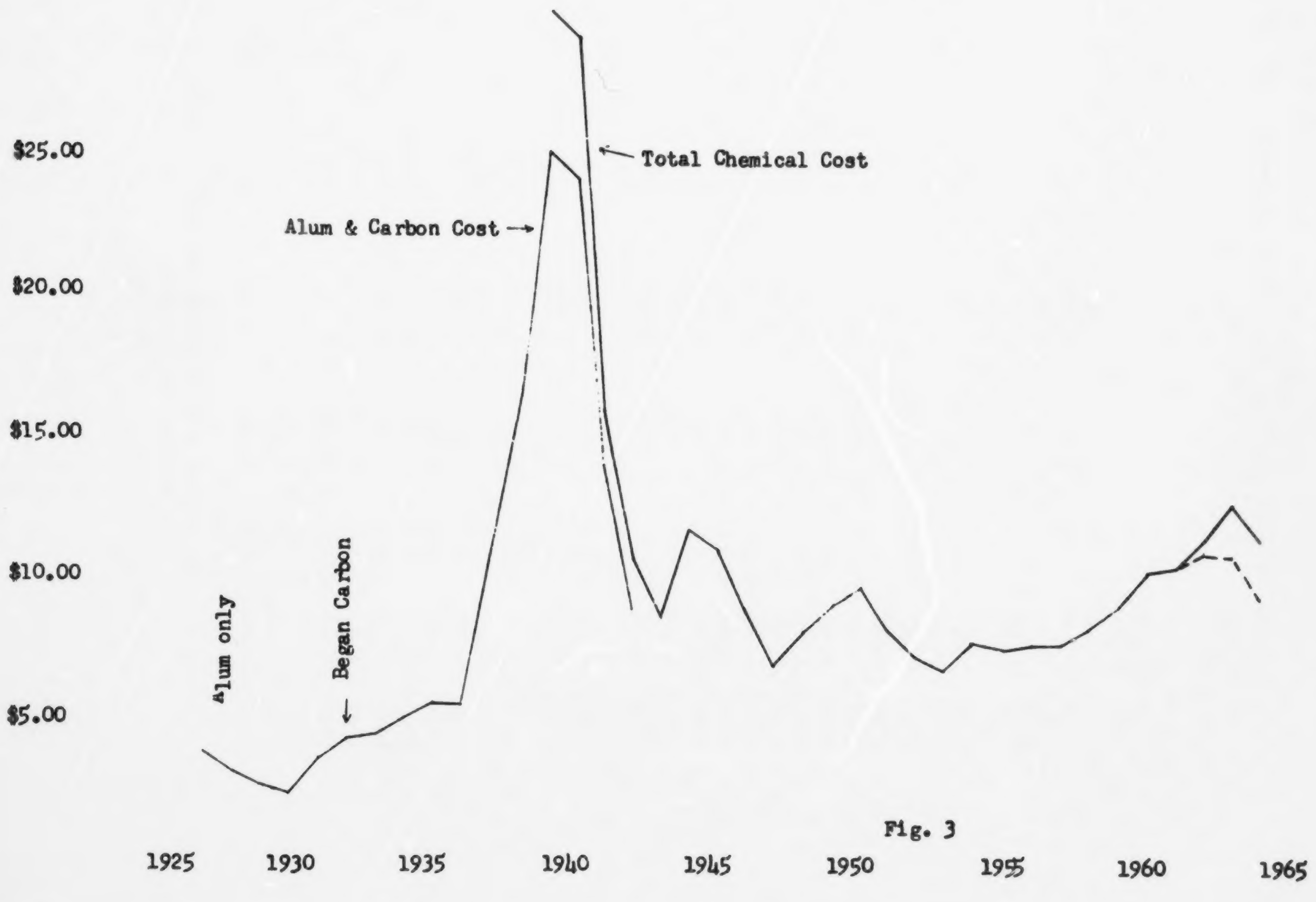


Fig. 3

TABLE NO. 1
Chemical Costs

Year	Alum	Lime	Chlorine	Carbon	Sodium Chlorite	Potassium Perman-ganate	Total
1927	4.38						4.38
1928	3.60						3.60
1929	3.16						3.16
1930	2.86						2.86
1931	4.13						4.13
1932	4.00			.81			4.81
1933	3.46			1.46			4.92
1934	3.70			1.87			5.57
1935	4.20			1.96			6.16
1936	4.04			2.00			6.04
1937	5.95			5.46			11.41
1938	6.26			10.72			16.98
1939	7.20	1.29	.89	16.15			25.59
1940	6.16	1.26	.97	16.25			24.57
1941	4.65	1.30	.80	9.60			16.45
1942	4.63	.98	.87	4.79			11.27
1943	4.06	.93	.93	3.27			9.19
1944	4.30	1.32	1.01	5.56			12.19
1945	3.92	1.01	1.00	5.60			11.53
1946	3.98	1.11	1.06	3.26			9.41
1947	3.92	.95	.94	1.73			7.54
1948	4.14	.93	.98	2.70			8.75
1949	4.31	1.09	.96	3.15	.22		9.73
1950	4.56	1.22	1.01	2.96	.54		10.28
1951	3.63	1.06	.95	2.43	.72		8.78
1952	3.38	.99	1.01	2.06	.43		7.88
1953	3.03	.90	.97	2.14	.39		7.43
1954	3.89	.87	1.10	1.97	.47		8.30
1955	3.79	.94	1.06	2.04	.32		8.15
1956	3.97	.88	1.27	1.79	.33		8.24
1957	3.87	.91	1.27	1.98	.29		8.32
1958	4.57	1.27	1.18	1.53	.34		8.89
1959	4.70	1.47	1.79	1.36	.36		9.68
1960	4.81	2.09	3.23	.64	.13		10.91
1961	4.16	1.87	3.52	1.27	.29		11.12
1962	4.17	1.78	3.90	1.58	.42	.20	12.04
1963	4.62	1.91	3.27	1.36	.26	1.85	13.27
1964	3.80	1.89	3.59	.61	.20	1.97	12.06

All costs based on 1964 prices
Alum - $2.49 cwt
Lime - 1.14 cwt
Chlorine - 0.05 per lb.
Carbon - 0.08 per lb.
Sodium Chlorite - 0.53 per lb.
Potassium Permanganate - 0.32 per lb.

1949 to 1958 - Same treatment with the exception of chlorine dioxide being used on the finished water instead of chloramine. The use of chlorine dioxide has been very beneficial in the control of taste and odor.

Late in 1956 the Beaver Falls Municipal Authority began construction of a 4.0 mgd addition to the Eastvale plant which increased the capacity from 6.0 mgd to 1.0 mgd. The additions consisted of a new chemical feed house, a new settling basin and two 2.0 mgd filters. This plant began operation December 1957. With this addition, the plant became very flexible for various types of treatment. The general treatment consisted of coagulation, primary and secondary sedimentation, filtration and chlorination.

Immediately after operations of the new addition began, along with new chemical control tests, it was found that a clearer water with less residual color could be produced at an increased alum dosage, along with the additional alum being used, the lime requirements increased. In addition to this, for years the plant effluent had a pH of about 7.2 and red water conditions began to appear throughout the distribution system, the pH was raised to 7.6 and again raised to a pH 8.4 in 1960. Since 1961 the pH has been controlled by the stability point as determined by the calcium carbonate test.

In 1959 we began the practice of break-point chlorination for taste and odor control, bacterial quality and manganese removal, and in 1963 we began using potassium permanganate for manganese removal in the wintertime when break-point chlorination is discontinued.

Figure 4 shows graphically the manganese content of the raw and finished waters from 1960 through 1964. It also indicates the pre-chlorination dosage in relation to the finished water manganese content along with the potassium permanganate use. This graph clearly indicates the effect of break-point chlorination and potassium permanganate in the removal of manganese. It also shows that we are providing a better water consistently in relation to the manganese content.

The use of break-point chlorination in the warmer seasons of the year has been very effective in taste and odor control and the potassium permanganate in the colder waters has also effected some taste and odor reduction, along with manganese removal.

The above statements concerning the present methods of treatment also explain the increased cost in chemical treatment since 1957.

The writer does not wish to convey the thought that we do not experience any taste and odor in the finished water. We still have problems and cannot control it as we would like to. On occasion we have had an algae taste in the summer for very short periods. We also have some difficulties in the winter especially when the river is frozen over and the water does not receive natural aeration, we still at times produce an unsatisfactory water as far as taste and odor is concerned. Also, on occasions, we experience taste and odor in the finished water after a heavy rain and a rise in the river, probably due to washouts along the river banks. Pipe line breaks of oil carrying transmission lines and breakdowns in waste treatment facilities of plants in the Youngstown area will give us additional problems. Mr. Wallace of the Youngstown Sheet and Tube Company has been very cooperative in notifying us about spills or pipe line breaks that he is aware of.

(See next page.)

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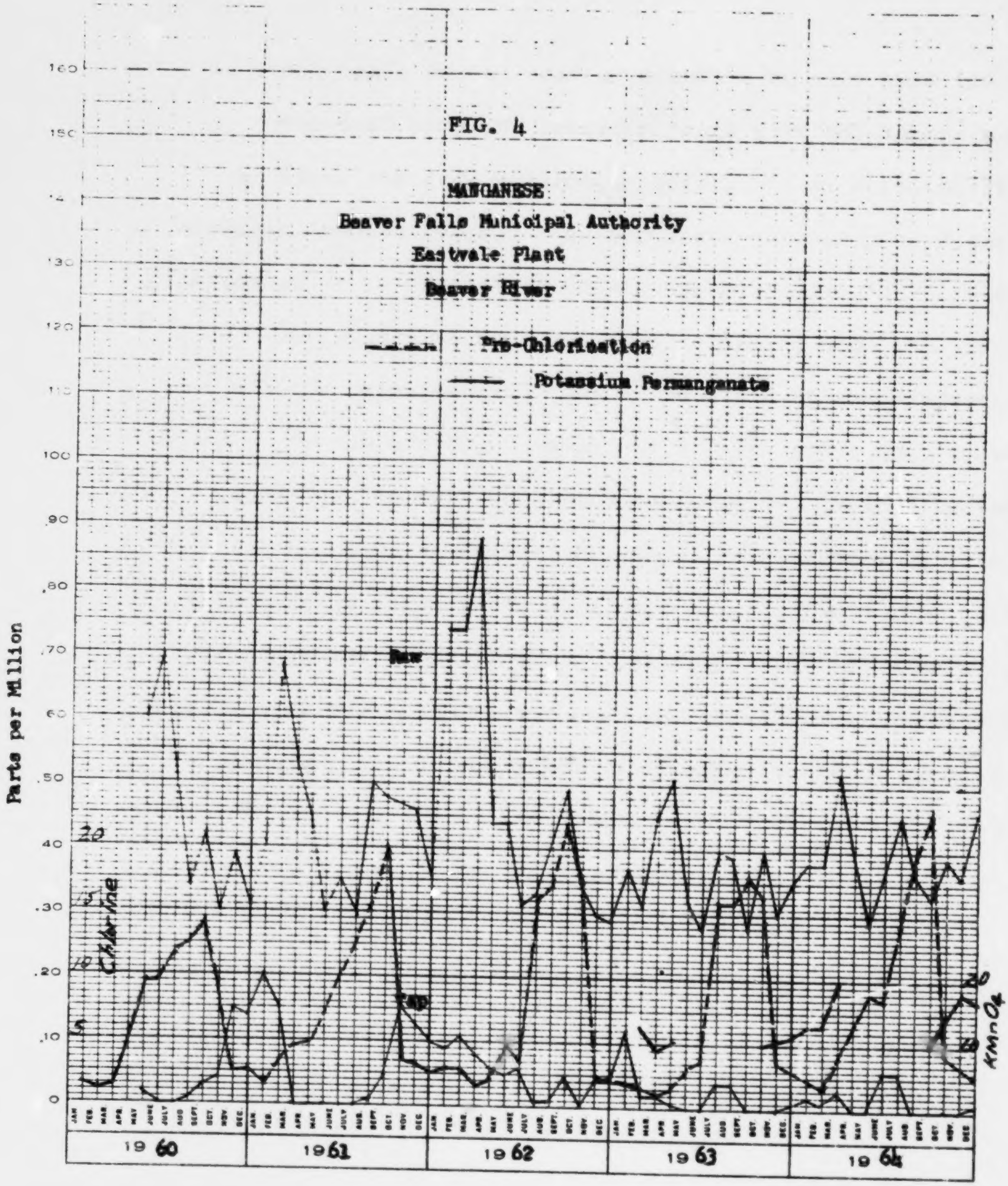

FIG. 4

MANGANESE

Beaver Falls Municipal Authority

Eastvale Plant

Beaver River

TABLE NO. 2

Manganese - Eastvale

	1960		1961		1962		1963		1964	
	R	T	R	T	R	T	R	T	R	T
Jan.			.41	.20	.74	.09	.37	.12	.38	.02
Feb.			.68	.15	.74	.11	.31	.02	.38	.01
Mar.			.54	0	.88	.08	.45	.02	.52	.03
Apr.			.45	0	.44	.06	.51	.10	.39	0
May	.60	.02	.30	0	.44	.05	.32	0	.29	0
June	.70	0	.35	0	.31	.06	.28	0	.37	.06
July	.51	0	.30	0	.33	.01	.40	.04	.45	.06
Aug.	.34	.01	.50	.01	---	---	.39	.04	.36	0
Sept.	.42	.03	.48	.05	.49	.05	.28	0	.33	0
Oct.	.30	.04	.47	.15	.34	0	.40	0	.39	0
Nov.	.39	.15	.46	.13	.30	.04	.30	0	.36	0
Dec.	.31	.14	.36	.10	.29	.04	.35	.01	.46	.01

TABLE NO. 3

Pre Chlorination in p.p.m.

	1960		1961		1962		1963		1964	
	Pre Cl	PH	Pre Cl	PH	Pre Cl	PH	Pre Cl	PH	Pre Cl	PH
Jan.	1.65	8.4	1.83	7.9	3.21	7.9	2.09	7.5	2.45	7.5
Feb.	1.28	8.3	3.73	7.8	3.01	7.7	1.62	7.4	1.70	7.5
Mar.	1.39	8.4	4.75	7.7	1.73	7.5	1.13	7.4	4.35	7.5
Apr.	5.35	8.2	4.95	7.6	2.26	7.4	1.58	7.4	6.71	7.5
May	9.50	8.2	7.44	7.7	4.96	7.4	3.34	7.4	8.95	7.5
June	9.60	8.2	10.20	7.7	3.50	7.8	3.73	7.6	7.90	7.5
July	12.01	8.1	12.70	7.5	16.50	7.5	16.05	7.5	14.20	7.4
Aug.	12.65	8.0	16.20	7.6	17.70	7.4	15.90	7.5	19.70	7.4
Sept.	14.32	8.0	20.25	7.7	22.00	7.5	18.30	7.5	23.60	7.4
Oct.	9.35	7.9	3.54	8.2	16.60	7.5	16.40	7.5	4.42	7.5
Nov.	2.53	7.9	3.40	8.2	2.56	7.5	3.80	7.5	3.64	7.5
Dec.	2.75	7.9	2.87	8.3	2.05	7.5	3.02	7.5	2.83	7.5

Potassium Permanganate Usage

	1960		1961		1962		1963		1964	
	Pre Cl	PH	Pre Cl	PH	Pre Cl	PH	Pre Cl	PH	Pre Cl	PH
Jan.							1.16		1.32	
Feb.							1.44		1.34	
Mar.							1.17		2.00	
Apr.							0.94			
May							1.04			
June					.940	6-1 6-30	---			
July					---		---		---	
Aug.							---			
Sept.							---		.98	
Oct.					1.16	For 5 Days	1.05		1.51	
Nov.							1.10		1.74	
Dec.							1.16		1.64	

On a few occasions the past two years while operating on break-point chlorination, we have experienced considerable difficulty. For instance on September 9, 1964, the pre-chlorination dosage was at 17.20 ppm with a satisfactory free chlorine residual, the demand for chlorine kept increasing to 58.51 ppm on September 14th and a satisfactory free chlorine residual could not be obtained; that is in the pretreated water. After a day or two the chlorine residual was satisfactory and the dosage decreased. The writer has not been able to explain this, however, it was noted from the ORSANCO robot monitor located at our plant that the dissolved oxygen content of the river water was running considerably lower than normal.

The conclusions, from the data studied and presented by the writer covering a period of 37 years from 1927 through 1964, from personal knowledge and discussions with the operating personnel from 1937 to 1957 and employed by the Beaver Falls Municipal Authority as its manager from 1957 to date, it is my opinion that the water of the Beaver River is quite difficult to treat in order to produce a satisfactory product at all times. It is also believed considerable improvement has been shown in the raw water between 1940 and 1954 along with improved quality of water delivered to our customers as a result of the method of treatment used.

With the new facilities and the increased flexibility of the treatment plant since 1957, the introduction of break-point chlorination, free chlorine residual and the use of potassium permanganate, has enabled us to produce a better quality water than had been produced in the preceding years. The increased cost amounts to approximately $4.25 per million gallons over the 1955-57 costs.

I would also like to state here in this conclusion that the number of times that we have had taste and odor problems has greatly decreased over the period of years along with our treatment of the way we are doing it.

While the Beaver River has improved in the years to about 1954, it appears that a static condition has existed since that time and in order to improve conditions of the river water, considerable improvements in waste treatment processes and sewage treatment facilities must be considered.

From our experience, the quality of water received at Beaver Falls is below the accepted standards. However, we will favor any program which would improve the water quality for the Beaver River Basin and I was very delighted to have been here yesterday to hear all of the improvements that have been made.

The fact that the Youngstown sewage treatment plant is now in operation and the fact that the New Castle sewage treatment plant will be enlarged, they have asked for bids for that, that makes us very happy down in Beaver Falls.

CHAIRMAN STEIN: Thank you, Mr. McBride.

(See next page.)

Without objection, your charts and tables will be included in the presentation. There may have to be one adjustment. We reproduce in black and white and you used a little color.

With your permission, we will ask the people who handle the reproduction to see if they can make that meaningful. I think it won't change your chart.

MR. McBRIDE: It was black and white, I colored it up so you could see it better.

CHAIRMAN STEIN: It will appear in black and white.

MR. McBRIDE: That's all right.

CHAIRMAN STEIN: Are there any questions or comments?

MR. POSTON: I think Mr. McBride is to be commended for a very fine report that he has presented here this morning. I know that he works hard at producing the best possible water for the people of Beaver Falls. Having been a waterworks operator myself, I am appreciative of some of his problems and some of the things that he has done here and I note particularly on page 9 where he has used some 58.5 parts per million of chlorine. I think this is somewhat of a record for the country.

While I am sure that he has produced safe water at all times, I would submit that his factor of safety decreases with every increased demand on the treatment capacity of his plant. I would like to ask Mr. McBride how many times during the past year he has received reports from Mr. Wallace of the Youngstown Sheet and Tube Company relative to a pollution spill coming down the river toward them.

MR. McBRIDE: Well, to tell you the truth, I don't keep track of them but he has called me and he stated yesterday that he called three times in '64, and I would agree with him. I don't have the exact number. I don't keep a count on them.

MR. POSTON: Mr. McBride, I stopped in your office on Monday and talked with you briefly and you indicated that there is a type of grass that has appeared in the river in the last two or three years since 1963. Would you describe what the situation is and how this influences your operation?

MR. McBRIDE: During the summer of 1963, we noticed a lot of green flowers, you might say, or seeds or pods on the Beaver River. It was so prolific that the newspaper -- one of the newspapers called and said "What's the green on the river?" We had noticed a few times before that. There is long grass, maybe that long (indicating) in great big clumps that would come down the river. A friend of mine took me in an airplane trip up the river and we found this green pod or the seeds prevalent all the way up on the western -- on the eastern bank of the river above the Conoquenessing. From there on we did not have the green seeds on it.

Then on up the river to New Castle and on up the Mahoning it was very prevalent; although the color of it was not green, it was gray, more or less. It was a septic condition, you might say, where the effluents of sewage plants and so on had accumulated on the grass. Now, with the rise of water we get a lot of it that still comes down. We have a boat dock there, a boat club by the plant. They have a cable across the river and at times we have had to have them cut the cable in order to let the grass through. It comes in our intake. We operate by hydraulic power partially and this grass shuts it down as far as hydraulic power is concerned.

It doesn't seem to have caused any taste and odor problems to amount to anything. It is more a mechanical problem of clogging.

MR. POSTON: Your experiences with chlorinationn of some 58 parts per million, do you know of any other waterworks in this area or to your knowledge where they use these quantities of chlorine?

MR. McBRIDE: No, I don't. That's the highest we ever used and that was four a day during a 24-hour period with an increase a few years earlier.

A few years earlier we had one up to 35 parts per million.

MR. POSTON: That's all I have.

CHAIRMAN STEIN: Do you have any, Mr. Cleary?

MR. CLEARY: Mr. McBride, I am wondering if you have an opinion as to why the water between 1940 and '54 showed some improvement, which I would presume that the pollution was increasing, and then after that period you have experienced more difficulties. Have any theories been elicited as to why this period of 1940 to '54 might have been different than before?

MR. McBRIDE: I am talking chemical costs. Over the years I feel that the taste and odor condition at Beaver Falls has been improved greatly. No, as far as I am concerned -- as far as my analysis shows, we still have some treatment problems. We are trying to put out a better water and I think we have, since we have made our addition to the Eastvale plant. The cost of lime is higher when you are watching that closely. The permanganate and manganese removal pre-chlorination, it naturally will cost more at the basic point chlorination.

We try to put out the best water possible and in order to put it out, you pay for it.

MR. CLEARY: I wondered if any theories had been stated if the water before 1954 was better after 1954 which was the period in which the improvement program was set forth in Ohio. I am just curious as to what might have happened during the great war activity and the industrial development, that the water might have been better than afterwards.

MR. McBRIDE: Well, on my basis, the only way I can figure I could do it was on a cost basis, now, assuming that the quality of the finished product was the same.

MR. CLEARY: I see. Thank you very much.

MR. POSTON: I have one more question. I noticed your last sentence in your statement you say that you would recommend higher standards be developed for the Ohio River basin both in Ohio and Pennsylvania. I wonder whether you or the Pennsylvania American Water Works Association would have any suggestions or thoughts on what these higher standards might be.

MR. McBRIDE: Well, I didn't make that statement. That's in my written statement but I didn't read it. I changed that last sentence.

MR. POSTON: Do you care to comment on that?

MR. McBRIDE: Well, yes, I will comment on that. I had submitted this or given a copy of this report to a member of the State Health Department in Pennsylvania and he says, "Do you want the standards, the water standards increased?"

I said, "I just want better water coming to our intake." He says, "Well, the standards are set up on the drinking water standards," and he says we have to get down. If we meet those standards, we are doing a fine job; and then I eliminated the increase in standards.

MR. POSTON: That's all.

CHAIRMAN STEIN: As I understand it, then, I think I know what the drinking water standards are. That deals with the quality of water you get in a water intake, is that what you are talking about?

MR. McBRIDE: Yes.

CHAIRMAN STEIN: And you would like to have water of that caliber coming past your intake?

MR. McBRIDE: I sure would.

CHAIRMAN STEIN: Okay, thank you. Dr. Arnold.

DR. ARNOLD: I have no questions.

CHAIRMAN STEIN: Thank you very much, Mr. McBride. Do you want to continue?

DR. ARNOLD: Ohio would like to continue with their participation and would call on Mr. Kenneth Watson, Water Consultant of the General Electric

Company, Niles, Ohio.

MR. WATSON: Mr. Chairman, conferees, ladies and gentlemen of the conference: My name is Kenneth S. Watson. I am the Manager of the Water Management Laboratory, General Electric Company, Louisville, Kentucky. I have worked for the company for over 14 years serving as the consultant on water management and waste control for the first 11 years of this period.

Perhaps before starting my presentation, for the benefit of the record, I should briefly outline my qualifications for appearing before such a conference. I have Bachlor and Master's degrees in Chemical Engineering with Sanitary Options. I am registered as a professional engineer in New York, Ohio and West Virginia. The American Sanitary Engineering Intersociety Board has certified me as a Diplomat in the American Academy of Sanitary Engineers.

Prior to going to work for General Electric, I served as Executive Secretary-Engineer of the West Virginia Water Commission and Assistant Director of the Ohio River Valley Water Sanitation Commission. It has further been my privilege to serve as President of the Water Pollution Control Federation and the Chairman of the National Technical Task Committee on Industrial Wastes.

The General Electric Company has operated manufacturing facilities in Ohio since 1912. The company's lamp operation came into being in Cleveland as of that date and its headquarters has been based there since.

There are at present 24 lamp plants, based in 13 cities operating in Ohio. Five of these plants have been operating under permits from the Ohio Water Pollution Control Board since 1953. The remainder of the plants or 19 are connected directly to municipal sewer systems so the permit procedure does not apply on these plants.

In addition to our lamp plants, we have a number of other operations in Ohio. The company's jet engine headquarters and manufacturing plants are located in Evendale. Company vacuum cleaners are manufactured in Cleveland. The Laminated Products Department, where Textolite is manufactured, is located in Coshocton. All of these plants discharge into the city sewer system, but most of the process water from Coshocton and Evendale is discharged to the stream. Evendale and Coshocton are operating under permits from the Ohio Water Pollution Control Board.

Further, the company operates a distribution assemblies department plant at Blue Ash near Cincinnati. Since this plant is not connected to a city sewer system, it is operating under permit from the State for discharge of both sanitary and process waste water into a small stream.

Company Efforts.

General Electric has a large stake in the water resources of the nation. Adequate water of the proper quality is absolutely necessary in the operation of most of our plants. Recognizing the importance of this water resource, the company has had a water management program under way for many years. This program is to a large degree concerned with the conservation and re-use of water so that this valuable water resource will not be squandered.

About 15 years ago, the company re-emphasized her interest in the importance of the Nation's water resources and stepped up her efforts to properly control pollution. Under this program, when a new plant is built, if stream discharge is planned, necessary waste treatment facilities are built along with the manufacturing facilities to properly protect the environment. If the discharge is into a city sewer system, pretreatment facilities are built when necessary to protect the sewerage system.

In existing plants, it is the company policy to cooperate fully and comply with all stream pollution control programs. Under both phases of this program, the company has built and is operating numerous rather expensive waste treatment facilities in many parts of the country. In spite of this type of diligence, emergencies do occur occasionally resulting in the discharge of some objectionable materials. In such cases, plant management corrects the situation as soon as discovered and attempts to develop a procedure for preventing a future reoccurrence.

Many of the company's plants in Ohio are small and not of the type of which would have serious pollution problems, nevertheless, consistent with the company's general philosophy, every effort has been made to keep wastes under control whether the plant discharged into a stream or city sewer system. This policy is just as much in effect today as it has been in the past as is borne out by one of our lamp operations in Cleveland. Modernization of these manufacturing facilities are in the planning stage for this plant connected to the city sewer system. About $200,000 worth of waste treatment facilities are projected in this modernization program.

Under the company approach, facilities within the Ohio plants range from a single limestone neutralization bed to a complex facility in Conneaut in which acids are neutralized, an oil emulsion is broken and solids are removed from the effluent by precoat filtration. In this largest treatment facility which had a cost of roughly $276,000, we worked closely with engineers from the State Department of Health and the company was issued, after appropriate review procedures, a permit for operation. This treatment facility was built at an existing plant in

1958 to comply with an area program impelled by the state. At about the time our facility went into operation the city also began operating a new treatment plant. The plant's sanitary wastes here discharge into the city system.

In the Blue Ash plant already mentioned, where electrical distribution equipment and motor control centers are manufactured, the sanitary sewage is passed through a package plant and then combined with the treated process water. The industrial wastes treatment facilities consist of a system for alkaline chlorination of cyanide concentrates and rinses and facilities for neutralization of acid and alkaline wastes. The combined wastes are then passed through a lagoon where stabilization and final settling takes place.

Monthly reports are submitted to the state on the quality and quantity of the effluent being discharged from this facility which was placed in operation in 1961. This Blue Ash system is somewhat comparable to a number of other Ohio locations where either sanitary sewage or process waste discharges or both are taking place under permits from the State of Ohio.

Mahoning River. The company is at present operating five plants in the Mahoning River basin. There are two plants located at Niles on sites adjacent to each other. Both of these operations have their sanitary sewage connected into the city sewer system. The process waters from the lamp glass plant flow into Mosquito Creek and thence into the Mahoning River proper so this is the only plant in the basin at present operating under permit from the Ohio Water Pollution Control Board.

This glass plant uses considerable quantities of hydrofluoric acid to clean and frost glass. By analyzing, in cooperation with the Ohio Department of Health, the load going to the creek, a decision was reached in 1956 to provide treatment facilities for the plant waste water. This was thus another treatment facility provided for an existing plant. The treatment unit was placed in operation in 1957 and has been inoperation since that date. The treatment consists of neutralizing the waste water stream with lime and then passing it through a clarifier to remove most of the solids. Periodically the solids which have been removed must be trucked to a dump.

The plant's monthly effluent reports to the state, covering daily analyses, show that the plant averages a removal of about 96.5 percent of the fluoride from the waste water before discharge. This treatment facility has an annual operating cost of about $20,000.

The remaining three plants, two in Warren and one in Youngstown, are connected to the city sewer systems and are thus not covered by state permits. No.

pretreatment of these wastes is necessary except for a small limestone neutralization bed or two.

Before 1964 the company operated another rather extensive treatment facility in the Mahoning basin at the Mahoning Valley Steel Company. This industrial wastes facility which had a cost of over $250,000 was put into operation in 1962. It provided treatment for spent pickle liquor, spent cyanide baths and rinse waters from pickling and plating operations. We have had no responsibility for this operation since 1963 when the plant changed ownership.

During the planning of this treatment facility for an existing plant we worked closely with the engineers from the State Department of Health. After appropriate review procedure the plant was issued a permit to discharge waste waters after treatment.

During the period while the industrial treatment facility was being built a major alignment of the plant sanitary sewer system was made so it could be broken loose from septic tanks and discharged into the city system. The building of the treatment facility at Mahoning Steel was part of a cleanup program for the whole area directed by the state. As a part of this program, the City of Niles also provided a new sewage treatment plant.

Progress in Ohio.

The company operates plants in many states and thus is familiar with numerous pollution control programs. We have been impressed with the pollution control efforts and progress in the Ohio basin. The Ohio River compact has been in place for many years coordinating and correlating the total effort for the basin.

Under this regional program, the State of Ohio, following up on groundwork laid even before the compact came into being, is doing a good job. It would seem that the permit approach represents a sound method of administering a proper program. We have further been impressed with the dedication and competence of the engineers from the State and ORSANCO with whom we have worked.

The point can always be made that progress in polution control is not rapid enough and I, at times, also have this feeling. In thoughtful review of the subject, however, it should again be realized that the pollution problem has developed over a period of years and some time is going to be required to bring it reasonably under control. Progress in the Mahoning basin, which is part of the regional effort also, would tend to indicate that the Water Pollution Control Board is keeping pace with its responsibility.

The presentation from the state and municipalities which we heard here yesterday certainly abundantly bear out that statement.

In thinking of the National Welfare and pollution control progress nationwide, it would seem that the Ohio basin now has the machinery in place well ahead of many other sections of the country to cope with the problem. ORSANCO is the organization which permits the basin to be considered as a total watershed and interstate matters can be resolved at this level. Complementing and supplementing this basin-wide effort are the programs of the individual states working with their contributory citizens. Therefore, if we as reasonable men conclude that progress in the Mahoning is too slow, our efforts should be in the direction of supporting the agencies leading the program by soliciting additional funds from state and Federal levels to permit the pertinent regulatory organizations to step up the pace.

CHAIRMAN STEIN: Thank you, Mr. Watson.

Are there any comments or questions?

MR. POSTON: Mr. Watson, I would like to ask you whether or not General Electric Company would be willing to give to the Federal Government that information on effluents from its plants?

MR. WATSON: Well, let's see if I can kind of put that into context for you. As many of you know, the General Electric Company is fairly extensively decentralized and our local plants have a large degree of autonomy but when you stop to think of the situation, they have to face the matter of fact day-to-day situation of producing products which have appeal and will sell to our customers and deliver a reasonable return to our shareholders; and in this kind of a climate, duplication of effort is not one of their strong points.

So they could, if they so elected, make this information available to the Public Health Service. They would normally work in the direction of cooperating fully with the duly constituted authority if this was a plant connected to the city sewer system; this would be the city. If it were a plant discharge into the waters of the state, it would be the state. And if they had any questions about the situation, there is an organizational structure at company level to which they could come for counsel.

And again, as I say, the information has been presented through normal channels and they would see no need for duplication of either. And if I may editorialize here a little bit -- in thinking in terms of a sound program for the benefit of the citizens, duplication of effort does not represent a sound expenditure of the taxpayer's money.

MR. POSTON: Specifically, then, I would like to ask in this Mahoning River interstate area if we were to ask for information on the effluents from plants in this area, tying it down a little bit closer here, would we anticipate that we can get information?

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MR. WATSON: Well, again, I might say the plant manager could decide to make this information available.

MR. WEAKLEY: Mr. Chairman, could I interrupt a moment? It seems a lot of time was taken up yesterday on this same exploration and it looks like more time is likely to be devoted to the same sort of inquiry today. I think it is completely out of order for this sort of discussion to take place in this particular conference. There is nothing in the Act or nothing under the authority for the conference that justifies going into this kind of an investigation or exploration, and I think it is completely out of order.

CHAIRMAN STEIN: Mr. Weakley, your remarks certainly bear on the record but I think the procedure we carry out under the conference is that we give the greatest latitude to people we ask questions. No one has to answer a question and I don't know that questions have to be asked, but I would suggest that Mr. Poston heard your remarks and he is a free agent here and can determine what to do.

MR. WATSON: Well, I really don't think I have to answer that question today for the reason that we have a reasonable standard operating procedure and this procedure would be followed, and this procedure, I think, would indicate that most plant managers would not turn over that information if they came to company level for counsel on the matter.

We would again counsel them in the direction of working closely and cooperating fully with the duly constituted regulatory agency and I think we both understand who that agency is today.

MR. POSTON: Thank you, Mr. Watson.

CHAIRMAN STEIN: I am not sure I do. Do you mean ORSANCO?

MR. WATSON: No, I do not mean ORSANCO. If the plant is connected into a municipal sewer system, it is that municipality. If it discharges in the streams of the state, it is that state.

CHAIRMAN STEIN: Okay, thank you, Mr. Watson.

Are there any further questions or comments? If not, thank you very much.

DR. ARNOLD: Mr. John E. Richards, of the Ohio Department of Health staff, will present the statement of Mr. Tom Anderson, who is the production engineer of the Packard Electric Division, General Motors Corporation, Warren, Ohio.

MR. RICHARDS: Mr. Chairman, conferees, ladies and gentlemen: My name is John E. Richards. I am engineer in charge of the sewage industrial unit of the Ohio Department of Health, and the title of this paper is Statement on the Waste Treatment Facilities at Packard Electric Division, General Motors Corporation, prepared by Thomas D. Anderson, Production Engineering, Packard Electric Division, General Motors Corporation, Warren, Ohio.

Since December, 1961, the plating facilities at Packard Electric Division, GMC, have been located in Howland Township, Trumbull County. Plating and allied finishing solutions used on a production basis include zinc, cadmium, silver, and cooper cyanide plating solutions; cyanide, alkaline, and acid cleaning solutions; and chromate conversion coating solutions. A sulphuric acid pickling system for cleaning drawn copper rod is also located in this general plant area, and has been operating since 1956.

Treatment facilities were placed in operation at the beginning of production in both of these areas. The Lacy Integrated Treatment System is used for treatment in the plating area while a conventional lime feeder-cyclator-filtration system is used for the treatment of pickling waste. Other waste materials such as oils, solvents, and sludges, are hauled away and either buried or burned.

The plating area is divided into four separate sections, which are production, waste treatment, chemical storage, and a small control laboratory. In addition to the treatment section of the plating area, the waste treatment facilities include a settling tank, a chlorine storage building, and two sludge beds.

The integrated system for plating waste is a closed system in which the treatment solution is pumped from a reservoir tank to treatment rinse tanks in each plating line. The solution gravity drains from the [illegible] into a collection tank and is then pumped back into the reservoir, thus forming the closed system. All parts leaving a tank containing cyanide or chrome solution are rinsed in treatment solution before being rinsed in running water. Fresh chemicals to maintain the treatment solution are added in the reservoir tank.

There are four separate treatment systems serving the plating department. In the first system cyanide is oxidized in the two-step alkaline chlorination reaction. The raw cyanides are first oxidized to cyanates and the cyanates are then broken down to carbon dioxide and nitrogen. In the second system, hexavalent chrome is reduced to trivalent chrome by the use of sodium hydrosulfite, and the trivalent chrome is then precipitated with sodium carbonate. The third system treats floor spill, which is primarily alkaline cyanides, by collecting it in a hold tank and chlorinating the solution batchwise to oxidize the cyandies to carbon dioxide and nitrogen. The fully treated floor spill solution is then pumped a sludge pond behind the plant, where the sludge settles out and the supernatant liquid either evaporates or drains off. Acid waste is neutralized in the fourth system. Spent acids are pumped from the plating lines into a hold tank in the treatment area. Sodium bisulfate is added to neutralize the acid and precipitate the chrome. The neutralized and treated acid is then pumped to the sludge pond.

All effluent rinse water from the plating department flows into a sewer settling tank just outside the building. The minimum design retention time is two hours, and the present flow rate is about 105 g.p.m. Rinse water leaves the plating department, flows into the retention tank, then flows over a weir. The weir has two outlets, and the water can either be sent to the plant salvage water system or be diverted to the city storm sewer. The effluent rinse water in the settling ank is analyzed once a week during normal operating conditions and the monthly report sent to the State Board of Health. The average analysis of the effluent rinse waters is pH 8.2, chlorides 30 p.p.m., CN less than 0.2 p.p.m., hexavalent chrome less than 1.0 p.p.m., and copper 0.00 p.p.m. Two sludge beds, primarily for floor spill and acid waste, are located behind the plant. Treated solutions flow into the first bed, then overflow into the second bed with the second bed overflowing periodically to a storm sewer.

The treatment facilities for the copper rod pickling system consist of a plating-out system, a cyclator and lime feeder, a filtration system, and a sludge bed. Rinse waters from the pickling operation, flowing at 25-30 g.p.m., are pumped through a sump to the cyclator where a lime slurry of about 20 percent solids is fed by pH meter. The treated water overflows the rim of the cyclator, is pumped through a set of sand filters, and flows into the storm sewer. Periodically, sludge is collected from the bottom of the cyclator and pumped to a separate sludge bed behind the plant. Here the solids, primarily copper hydroxide and lime, settle out, and the water either drains off or evaporates. In addition, the pickle solution is constantly recirculated through a plating-out system which regenerates the acid and also reduces the amount of copper which must be treated in the rinse water.

Samples of effluent water are analyzed once per week during normal operating conditions, and a report is sent each month to the State Board of Health. The average conditions during normal operation are raw wastes: 92.0 p.p.m. copper and a pH of 4.5; and treated water, after filtration: 0.17 p.p.m. copper and a pH of 8.5.

Packard's waste treatment facilities are complete in their capability to destroy or otherwise render harmless all waste materials generated by Packard's production processes. Packard's goal is the continued successful operation of its waste treatment facilities in full compliance with the requirements of the Ohio State Board of Health. A positive program of industrial waste treatment is a major factor in solving the water pollution problem, and Packard has given its full support to the State of Ohio's water pollution control drive in the Mahoning River Valley.

Thank you.

CHAIRMAN STEIN: Thank you, Mr. Richards. Are there any comments or questions? If not, thank you very much.

DR. ARNOLD: We see now, Mr. Clyde Cupps, plant engineer of the bumper division of Rockwell Standard Manufacturing Corporation, Newton Falls.

MR. CUPPS: Mr. Chairman, conferees, and ladies and gentlemen: I am Clyde Cupps. The correct

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name of the company is Rockwell Standard Corporation.

Rockwell Standard Corporation Bumper Manufacturing Plant presently employs 850 people with an annual payroll of $5 million and is located at Newton Falls between the east and west branch of the Mahoning River about one mile south of the confluence of the two rivers. The predecessor company, The Standard Steel Spring Company, purchased what was formerly the Newton Steel plant and started to manufacture automobile bumpers in 1947. To date, 24 million bumpers have been produced at this plant.

The various operations that are performed in the manufacture of an automobile bumper consist of:

1. Rolled sheet steel as purchased from the steel mills are pickled to remove mill scale

2 Sheets are polished with abrasive belts to remove surface imperfections.

3. Bumpers are formed on dies using two and three thousand presses.

4. Finish polished to remove die marks and other surface defects.

5. Cleaning operations in a sequence of alkali and acid baths with intermediate rinses in running water.

6. Nickel plate in semi-brite and brite nickel baths.

7. Buff the nickel to a high luster on cloth

wheels.

8. Chromium plate.

9. Pack and ship.

Water for processing and cooling is pumped at a rate of three million gallons per day from the east branch of the Mahoning River, and is used without treatment. Three-quarters of a million gallons a day is purchased from the Newton Falls municipal plant for sanitary use and for operations requiring filtered water. The quality of the water from these sources has been satisfactory, and no problem with water quality is anticipated in the foreseeable future.

The waste waters are segregated and discharged to three separate sewer systems.

First, storm, cooling and uncontaminated water is discharged directly to the river.

Two, waste water containing alkalis, acids, soaps and heavy metals are collected in a sump and pumped to the waste treatment plant.

Three, sanitary wastes are discharged to the Newton Falls sewers and sewage plant.

The treatment of the metal finishing wastes, about eight-tenths million gallons per day consist of:

1. Reduction of hexavelent chromium using waste pickle liquor with continuous O.R. and pH control.

2. Neutralization of the chromium wastes combined with other wastes to a pH of 7.5 - 8.5 using dolomitic lime.

3. Continuous setting.

4. The clarified effluent is discharged to the river.

5. Sludge is pumped to an earthen lagoon for further dewatering and settling. 140 acre feet sludge has been accumulated in the abandoned lagoons. A new lagoon was constructed and started in service during 1964. New treatment facilities at today's prices would amount to about a quarter million dollars.

The lime requirements for the treatment of wastes averages about five tons per day of dolomitic oxide.

The treatment produces an effluent of pH value of about 7.5 to 8.5 and substantially free from heavy metals -- iron, 1-3 ppm, chromium, less than one part per million; and nickel, 5-10 ppm. Effluent analyses are submitted periodically to the Ohio Department of Health.

Disposal of sludge is a major problem with this method of treatment. Our Research and Development Division located in Birmingham, Michigan, is currently working on the sludge problem.

The Ohio Department of Health and ORSANCO have furnished excellent leadership and the company has unhesitantly responded to demonstrable needs for the protection of the Mahoning River.

The Ohio Department of Health program for the abatement of pollution in the Mahoning Valley is realistic and will best serve the interests of its people and industry. Any Federal action that is not coordinated with Ohio State agencies would, in our opinion, only add confusion and unduly delay the cleanup program.

Thank you.

CHAIRMAN STEIN: Thank you, Mr. Cupps. Are there any comments or questions. If not, thank you very much for your statement.

DR. ARNOLD: The Secretary of the Ohio Coal Industry Water Pollution Committee would wish to make a statement.

CHAIRMAN STEIN: Would you identify yourself for the conferees?

MR. COOK: My name is Larry Cook. I am appearing as Secretary of the Ohio Coal Industrial Water Pollution Committee on behalf of the Ohio coal industry in the Mahoning Valley.

The Ohio segment of the Mahoning River watershed embraces most of Mahoning County and portions of Trumbull, Portgage, Stark and Columbiana. The area of the basin in the above counties amounts to 1076 square miles.

Mineable coal beds underlie the entire basin. The earliest recorded mining in the area occurred in 1835. Since then the area has produced over 50 million tons of coal. All of this production prior to 1920, and practically all of it prior to 1938, was by underground mines. Since 1950 practically all of the production has been by strip mining, and there are now no underground mines reported in the area. The present annual production is approximately 600,000 tons, all by strip mining.

Historically, the iron and steel and the coal industries of the Mahoning Valley are intimately related. The discovery of the Sharon conglomerate beneath the Sharon coal along the Mahoning and Shenango Rivers led to the location of the second blast furnace in the United States at Youngstown in 1846. It was not until the Civil War that the pattern changed and iron ore brought in from the upper Great Lakes demanded coking coal. Since then most of this type coal has come from Pennsylvania, and most of the steam coal has been produced in Ohio.

It is significant to note that in spite of coal mining in this area of Ohio, acid drainage from coal mines is not listed as a contributor to the pollution of the Mahoning River by the Public Health Service in its January 1965 pre-conference report on the quality of these waters. This is taken to be silent evidence of the effectiveness of the controls exercised by the industry and the State of Ohio both through reclamation procedures and ORSANCO Resolution 5-60.

(Slide 1)

There are at present 15 active mines in the Valley. The coals produced are the Bedford, the Brookville No. 4, the Lower Kittanning No. 5, the Middle Kittanning No. 6 and the 6A or 7, as it is known locally. Although some of these seams are overlain by limestone or calcareous shales, others are associated with iron sulphide bearing materials which produce acid upon contact with the air.

In spite of this, tests of the effluent from each of these mines taken between October 1 and December 1, 1964, showed the following pH's:

1. Carbon Limestone - Poland Township, Mahoning County - 7.3.
2. R & T Enterprises - Springfield Township, Mahoning County - 6.5.
3. Marshall Mining - Springfield Township, Mahoning County - 7.5.
4. East Fairfield Coal Co. - Springfield Township, Mahoning County - 6.5.
5. East Fairfield Coal Co. - Beaver Township, Mahoning County - 6.0.

6. American Fire Clay & Products, Inc. - Beaver Township, Mahoning County - 6.9.

7. G & K Coal Co. - Green Township, Mahoning County - 6.0.

8. Buckeye Coal Mining Co. - West Township, Columbiana County - 7.1.

9. East Fairfield Coal Co. - West Township, Columbiana County - 7.2.

10. Sunnyside Coal Co. - Smith Township, Mahoning County - 7.0.

11. H. S. Peterson & Son - Smith Township, Mahoning County - 5.5.

12. Sunnyside Coal Co. - Lexington Township, Stark County - 7.0.

13. Keller Mines - Smith & Lexington Townships, Mahoning and Stark Counties - 8.0.

14. M & G Coal Co. - Lexington Township, Stark County - 6.5.

15. Peterson Coal Co. - Atwater and Deerfield Townships, Portage County - 5.5.

As an illustration of the close check maintained by the coal industry on the chemistry of both the earth and the water associated with the mining operations, are the following actual analyses. Dr. Charles Riley, head who serves as a consultant to the industry, has over 120 of these tests for the strip mine region of Ohio.

(Slide 2)

Analyses of Spoil
#5 Coal, Springfield Twp., Mahoning County
August, 1962

	#1 Sample	#2 Sample
pH	5.0	6.4
Organic Matter %	3.3	1.7
Plant Foods - lbs./acre		
Nitrate N. (NO_3)	0.2	0.9
Ammonia N. (NH_3)	51.0	19.0
Phosphate (P_2O_5)	3.3	3.7
Magnesium	186.0	298.00
Potassium (K_2O)		
Calcium	1330.0	8400.0
Trace Elements - lbs./acre		
Iron Ferric	0.4	0.4
Manganese	2.98	8.69
Boron	0.34	0.33
Copper	2.8	4.8
Zinc	T	14.0
Molybdenum (PP2B)	50.	200.0
Sulphate (SO_4)	267.0	85.0
Chloride	14.0	3.9
Aluminum	2.5	3.54
Total Soluble Salts	1600.0	1300.0

PP2B equals parts per 2 billion.

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(Slide 4)

Water Analyses
#7 Coal, Water Impoundment
1956

Age of Pond and Size	1 year 1 acre	6 yrs. 1.5 acs.	21 yrs. 2 acs.	*F. Pond 0.5 acs.
pH	7.28	7.60	7.86	7.8
Specific Conductance (MMhos/cm)	245	525	330	145
Dissolved Oxygen (ppm)	9.6	7.96	8.80	9.54
Free CO_2 (ppm)	5.8	3.2	1.52	1.10
Total Acidity(ppm $CaCO_3$)	3.5	2.5	1.0	5.0
Total Alkalinity(ppm $CaCO_3$)	57.0	36.0	54.0	35.0
Total Hardness ppm($CaCO_3$)	120.	290.	174.0	72.0
Sulfates (ppm SO_4)	71.7	243.	119.7	35.8
Total Iron (ppm)	0.15	1.05	0.55	1.00
Silicia ppm (SiO_2)	2.4	6.5	6.0	0.90

(Slide 5)

Water Analyses
Lexington Twp., Stark County
1962

	#4 Coal Pit Pond	*Deer Creek
pH	7.5	7.8
Total Acidity	0.0	0.0
Total Alkalinity	170.0 ppm	180.0 ppm.
Sulfate (So_3)	28.8 ppm.	64.0 ppm.
Calcium	65.0 ppm.	84.4 ppm.
Magnesium	15.5 ppm.	25.6 ppm.

	#4 Coal Pit Pound	* Deer Creek
Total Iron	1.0 ppm.	0.5 ppm.
Total Solids	261.6 ppm.	400.8 ppm.
Total Chlorides (NaCl)	32.7 ppm.	152.1 ppm.

The Ohio strip mine reclamation law requires, where feasible, the impoundment of water in the last cut of an operation for, among other purposes, that of controlling water pollution. The efficacy of this procedure, where the water impounded is acid, had been questioned. Certain of the scientists who had worked with the problem, among them Dr. Charles Riley, who had experience to prove his point, contended that in a period of a few years the acid impounding would lose its acidity.

In the fall of 1958, at the request of the state's Strip Mine Board of Review, the Ohio Coal Industry Water Pollution Committee set up an experimental project at an abandoned pre-law, strip mine near North Lima, in Mahoning County, on site which was described as practically hopeless. Offering technical assistance were Dr. S. A. Braley, Mellon Institute; Russell A. Brant, Division of Geology, Ohio Department of Natural Resources; Ernst P. Hall, Secretary, Coal Industry Advisory Committee to ORSANCO; Dr. Charles V. Riley, Kent State University, and Ned E. Williams, Chief Engineer, Ohio Department of Natural Resources.

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* Deer Creek sample collected upstream from where pit effluent entered the stream.

It was known as the Sheban Project after the company which had originally carried on the mining.

For one year, exhaustive tests were made of the entire area. Then in September 1959 an earthen dam was placed in the final cut as required on all areas strip mined in Ohio since 1949.

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Before impoundment, this area had been bleeding acid for 10 years at the rate shown in the series of tests made in 1958 and 1959. Since the entire overburden was acid there was no opportunity to seal it other than by water, and without the impoundment it would have continued to bleed acid indefinitely. Less than five years after the impoundment was made, you will note the phenomenal drop in both acidity and sulphates. As the note says, this has been a steady decrease.

Sheban Experimental Impoundment

Before impoundment, water analyses by Dr. Braley, between dates of October 1958 and September 1959 were as follows:

pH	2.7 to 3.4 range
Acidity	3523. to 5240. ppm.
Sulfates SO3	4393. to 5676. ppm.

Impoundment was made in the fall of 1959.

On June 18, 1964, tests by Wadsworth Testing Lab., Canton, Ohio, showed the following results:

pH	3.1
Acidity	850. ppm.
Sulfates	1670.8 ppm.

Whether it will remain at this point or become progressively better, remains to be seen. Tests were made in 1959, after impoundment, then in 1960, 1961, 1962, and 1964. A progressive decrease in acidity was noted.

(Slide 7)

Fortunately, most of the water in strip mine impoundments in Ohio is good and clean from the beginning. This final cut strip mine lake in Springfield Township, Mahoning County, is a half mile long, 35 feet deep, and a hundred feet wide.

(Slide 8)

Over 225 acres of water have been impounded in the strip mine pits of the Mahoning Valley. This lake in Canfield Township has a pH of 6.8.

During the last 20 or more years, many of the old underground mine workings in the Mahoning River watershed have been stripped around or into. The acid effluents from these workings have complicated the pollution problems of the strip mine operator, but in the process of correcting them he has lessened the acid mine-drainage problems of the basin manyfold for many years.

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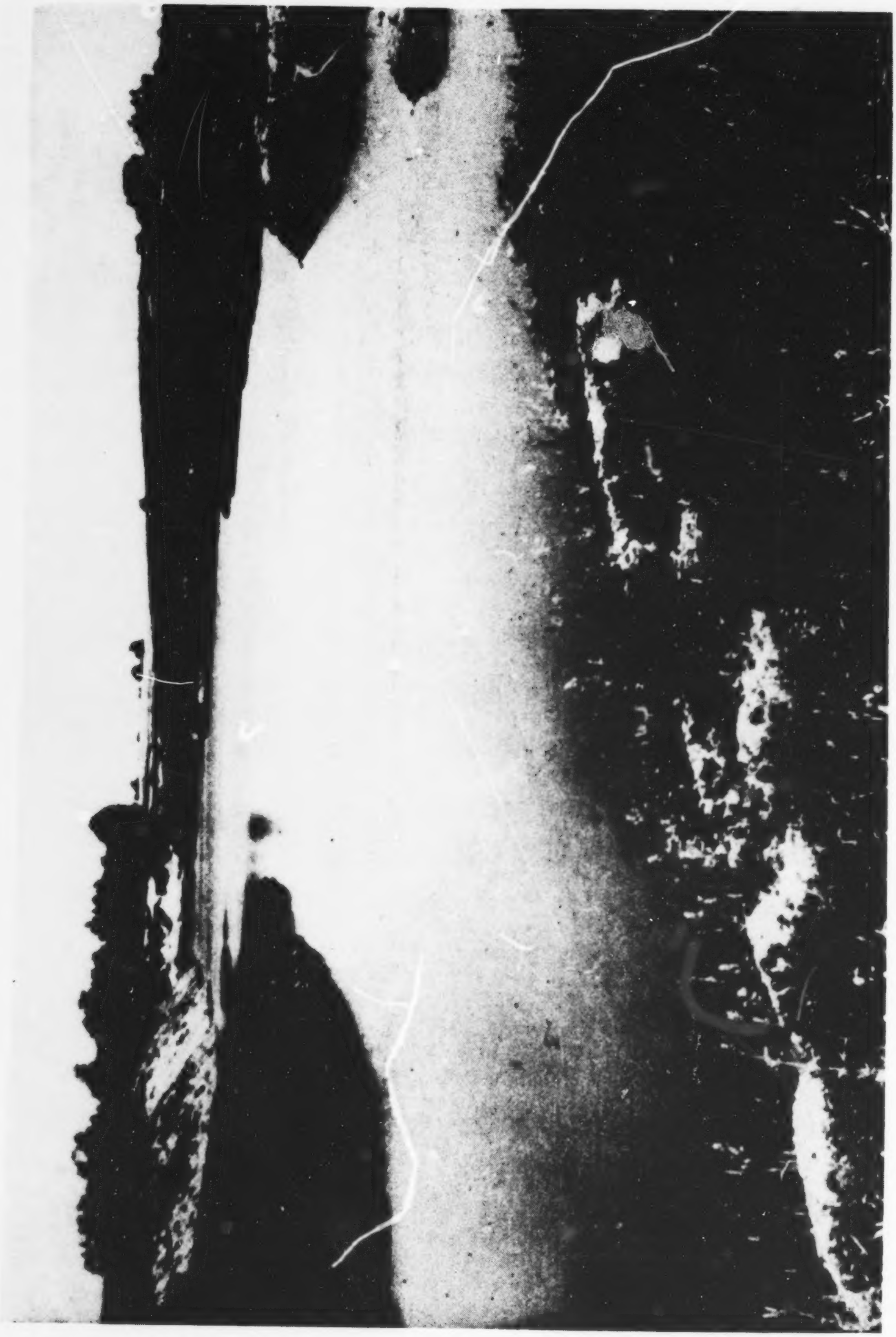

Occasionally a situation arises which is unforeseen, and requires more than the ordinary measures to correct. Such a condition has devloped above Dun Eden Lake in Goshen Township, Mahoning County, in an area of former mining operations. Apparently, although all parties carried out their obligations in good faith at the time, pollution has developed. There are now legal as well as physical and financial obstacles in the path of an easy solution. A court decision may be necessary to resolve certain facets of the problem before direct action can be employed. This is as regrettable to the coal industry as to the other parties concerned.

The Ohio Coal Industry Water Pollution Committee will,in the future as in the past, exercise its best efforts to help correct the extraordinary situations which arise, as well as to resolve the run of the mine pollution problems of the industry. We are convinced of the soundness of the measures for the control of acid mine-drainage contained in ORSANCO Resolution 5-60, and we offer our support to both ORSANCO and the Ohio Water Pollution Control Board in the implementation of these measures throughout the Ohio coal industry.

Thank you.

CHAIRMAN STEIN: Thank you, Mr. Cook, for an enlightening statement of your work on what we all know is a very difficult problem. You are to be commended for that.

Are there any comments or questions? If not, thank you very much, Mr. Cook, and may we have the lights again, please.

DR. ARNOLD: Mr. Stein, this concludes Ohio's presentation at this conference.

CHAIRMAN STEIN: The next presentation will be by the Federal Government and we hope to push on and see how much of that we can accomplish. We would like to take a short break of scarcely more than five minutes. However, I should tell you that the management has coffee and rolls outside but we are going to start and if you are interested in that, go ahead.

Thank you.

(Recess had.)

CHAIRMAN STEIN: I wonder if we can reconvene. As is inevitable with a roomful of engineers, the sound system has gone off and I understand there is an electrician to come up. We will try to talk more loudly, so you can either come up front or rest peacefully in the rear but I don't guarantee you will hear everything that is said.

We will now call on Mr. Poston from the Federal Government.

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MR. POSTON: In line with the conference procedures that the conferees invite persons with whom other Federal interests are involved in the case of Federal agencies, I have written letters to the Federal agencies and invited them to participate and to give a statment relative to their interests in this matter of the Mahoning River.

I would like to call on, at this time, Mr. Fred Wampler, Regional Coordinator for the Ohio River-Appalachian area, U. S. Department of the Interior. Mr. Wampler will talk to you about the Department of Interior interests in the Mahoning River.

MR. WAMPLER: Mr. Chairman, members of the conference, I am Fred Wampler, Regional Coordinator, Ohio River-Appalachian Area, U. S. Department of the Interior, and it is a pleasure to come before this committee.

CHAIRMAN STEIN: Mr. Wampler, I thought I recognized you. Mr. Wampler formerly was a member of Congress, I understand, and has always been a strong advocate of pollution control and interested in water resources. It is a pleasure to see you again.

MR. WAMPLER: Thank you, I appreciate it very much. With me today I have two members of the Geological Survey. One is George Dove, the District Geologist and Mr. Charles Collier, the District Engineer of water quality, and their headquarters are in the Mid-Continent Sub Area in Cincinnati, Ohio. I wonder if you gentlemen will stand so you know them. In order to clarify the duties of the Regional Coordinator with the Department of Interior, may I say that we divide the United States into nine areas and within the Department we have a total of 29 bureaus. We try to integrate the activities of each and every bureau with that of other Federal and local and state agencies in developing resources.

With our headquarters in Cincinnati, why, we feel this is a very vital spot in developing a five-state area. To save time and not infringe on the presentation of my distinguished colleagues, I shall give a concise picture of the chief interests and concerns of the various bureaus within the Department as it relates to water pollution.

Each of these agencies has a direct concern with aspects of water quality and are conducting programs in this broad field.

Water, the problems and opportunities it carries, ignores state, regional, and international boundaries. It is important that the interrelationships of water use be recognized, and that state, Federal and local government agencies charged with various aspects of water management and development work harmoniously in solving these many

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problems. The Department is pleased to meet with the States of Ohio and Pennsylvania, and the Ohio River Valley Water Sanitation Commission (ORSANCO) are concerned with the matter of pollution on the Mahoning River. We pledge our assistance and cooperation to these agencies and to the Public Health Service in the specific action designed to meet the pollution problems existing in the Mahoning River.

I know of no better way to express the views of the Department of the Interior than to revert back to a statement of Secretary Udall when he appeared before a subcommittee of the House Committee on Government Operations, during the first session of the Eighty-Eighth Congress early in 1963. This statement expresses the Department's interest in maintenance of clean water, as follows:

> "...the focus of Interior effort is directed to the maintenance of adequate national water supplies and adequate water quality for whatever uses man may wish to make of this valuable resource. The Interior approach emphasizes the coordination of and interrelation between uses, and the effect of these uses on management and quality of the total water supply system.
>
> "Maintenance of water quality involves not only the quality levels for human use but also quality levels for use by other animal and plant

> life, for development of other natural resources, and for industrial processes. These quality considerations are interrelated. They can be understood and controlled best from the point of view of water as a resource, rather than from the point of view of a particular quality need."

While each bureau has its own program in the field of water quality, the Department exercises the administration necessary to assure that all programs are coordinated to avoid duplication and to achieve maximum results. Therefore, I will attempt to outline briefly the functional responsibility of those bureaus concerned in the matter of pollution of the interstate waters of the Mahoning River.

Mr. Chairman, during the statement that is to proceed, should any questions be directed involving any of our specific bureaus, the point will be well taken and with your permission, we will ask each bureau to submit, for the record, the reply to this specific question.

CHAIRMAN STEIN: We will certainly do that.

The Geological Survey provides scientific information on the physical environment of water that is required for the successful development, use, and control of water. All phases of the survey's work are designed to obtain timely and appropriate water facts needed for the solution of water problems. Topographic quadrangle maps prepared by the survey give information on the surface features of river basins; its geologic maps give information on rock types and structure which control ground water occurrence and movement. Hydrologic maps and reports based on these topographic and geologic data present information on the quantity, quality, and distribution of the water resources of the United States. Programs and individual projects are designed cooperatively with state and local governments and other Federal agencies; the survey has responsibility, also, for the design of the national network of hydrologic data collection. Results of these projects are available to all in the form of maps and reports. The Geological Survey wishes to continue its cooperation with Federal and state agencies in the Mahoning River basin to obtain the information on water and its environment that is most needed in the solution of the pressing water problems. These agencies and those to which data and information have been furnished include ORSANCO, Ohio Department of Health, Ohio Department of Natural Resources, Pennsylvania Department of Forests and Waters, U. S. Public Health Service and the Corps of Engineers, Pittsburgh District.

In the Bureau of Mines, the water problems with which we are concerned today involve many situations which must be dealt with comprehensively in order to achieve coordinated progress.

The Bureau of Mines is concerned with water both as a commodity and because of its utility in the mineral production and processing industries. Over a period of years the Bureau has accumulated the experience, facilities, and qualified manpower to deal with a wide variety of these problems. The studies with which we are concerned are chiefly those requiring knowledge of chemistry, geology, metallurgy, engineering, and in some degree bacteriology. We are particularly concerned with the effect of water quality in the processes of developing and using mineral resources and with the nature of water effluents from operations of the mineral industries.

In common with other agencies, the Bureau of Mines has interests and responsibilities in the economic and social aspects of water quality management. Quantity requirements and competitive uses must be given consideration in programs for multiple-purpose water development projects. Particular account is taken of the economic effect and other values that protection of water quality and pollution abatement will have on the community.

In the Mahoning River basin minerals have been produced and processed for many years. As mineral industry activities and products play vital roles in our economy, it is obvious that this nation must continue to meet its growing mineral demands. Output of these mineral products requires process water and often generates waste effluents that degrade the quality of the stream.

Stream pollution from process wastes and from coal mine drainage now are generally recognized to be serious problems. Enlightened management in the mineral industries recognizes the need for meeting responsibilities to the public. Within the limits of available technology and economics, it adopts controls on its waste discharges. However, pollution abatement programs take time to become effective and sometimes industry, understandably so, does not welcome controls for which current technology affords no economically practical means of compliance.

For example, acid mine drainage problems often are baffling. From laboratory research and field studies a number of methods have been developed for control of acid mine drainage. These measures generally fall into the following categories:

(1) Reducing water entry into mines

(2) Minimizing the contact time between water and acid-producing materials

(3) Regulating the flow of waste water to the streams

(4) Regulating the flow of receiving streams

(5) Neutralizing acid water

(6) Covering the acid-producing materials to prevent water flowing through them at the end of mining operations.

Federal, state and private organizations all have contributed to the progress that has been made.

But the means at hand have not yet solved the problem as a whole. Further studies are being conducted by the Bureau to demonstrate and appraise the effectiveness of current methods, to develop new methods, and to increase knowledge of the fundamental chemical and physical factors that influence acid generation. In this work the Bureau of Mines is cooperating with the Ohio River Valley Water Sanitation Commission (ORSANCO), the U. S. Geological Survey, the Department of Health, Education, and Welfare, and other agencies. The Bureau is accelerating its water programs and is confident that technically feasible solutions can be found for most of the problems that are presently involved. It welcomes opportunities to assist or cooperate with other organizations that have similar objectives.

The Bureau of Outdoor Recreation. The Mahoning River basin encompasses an area of 1,133 square miles and contains four reservoirs open for recreation use - Milton,

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Berlin, Mosquito Creek, and Deer Creek. These four impoundments have a total water surface area in excess of 13,500 acres. One additional reservoir, Meander, contains over 2,000 surface acres of water but is closed to recreation use.

Total visitation at Berlin and Mosquito Creek Reservoirs exceeded 1.5 million during 1963. Visitation figures are not available at this time for Milton and Deer Creek Reservoirs. Youngstown's Mill Creek Park, containing four small lakes which total 175 acres on Mill Creek, attracted over one million visitors in 1963.

In spite of a relatively high water-land ratio within the Mahoning River basin, water oriented recreational opportunities are inadequate for the large population concentrations of nearby industrial centers. Seven major metropolitan areas with population of over six million people are within one hour's driving time of the basin. The ORRRC report has indicated that the majority of recreation use to water-oriented recreation areas originates from high population centers.

Preliminary demands and needs studies being undertaken by this office in connection with the Corps of Engineers' Ohio River Basin Comprehensive Study indicate the demand for recreation within this portion of the Ohio River basin will double by 1980 and quadruple by the year

2010.

It should be noted that pollution of the Mahoning River below Warren, Ohio, will seriously hamper efforts to meet existing and projected recreation demands. Waters of this river are subjected to thermal changes and entry of polluting substances from industrial, municipal and storm sewers which create a health hazard to persons attempting water contact activities and cause visual nuisances, noxious odors and a near total destruction of opportunities for water-based recreation.

The Bureau of Sport Fisheries and Wildlife reports that no original water quality analysis of this river has been made directly by that bureau. Their information is based on data gathered by other agencies.

The reservoirs of the Upper Mahoning basin provide considerable fishing opportunity adjacent to the most heavily populated portion of Ohio. These include Pymatuning, Lake Milton, Berlin, Mosquito, and Deer Creek Reservoirs. West Branch and Shenango Reservoirs, which are presently under construction by the Corps of Engineers, will provide additional fishing opportunity. We estimate that in 1960, impoundments supported 580,000 fisherman days use annually in the Mahoning-Beaver River basin. These reservoirs are all located out of the heavily polluted areas of the basin.

The Mahoning River itself, not including impoundments, supports a lightly used fishery upstream from Warren, Ohio. Water quality in the Mahoning River is so poor downstream from Warren to its confluence with the Shenango River to form the Beaver, that no sport fishery exists in this reach.

The public land connected with the reservoirs of the basin, especially at Berlin, Mosquito, and Pymatuning, sports a great deal of hunting pressure. The land along the Mahoning, especially downstream from Warren, is so heavily developed by industry and urban dwelling that hunting is not possible or practical. Waterfowl use of the Mahoning River upstream from Warren and on the reservoirs of the basin is extensive especially during spring and fall migrations. However, pollution and industrial and urban development severely limit waterfowl use of the Mahoning downstream from Warren.

Considerable improvement in water quality would be necessary before a significant fishery can exist in the Mahoning downstream from Warren. It is unlikely that wildlife can be greatly benefited by pollution abatement in this reach of the river due to extensive industrial and urban development adjacent to the stream.

The Bureau of Commercial Fisheries reports that there is no commercial fishery in the Mahoning River at present. Potential for future development as part of a modernized commercial fishery operation throughout the Ohio basin would require substantial abatement of the serious existing pollution (including thermal pollution) situation below Warren.

Mr. Chairman, the Department of the Interior assures the conferees that every effort will be extended toward achieving the goal of acceptable water quality in the Mahoning River basin.

CHAIRMAN STEIN: Thank you, Mr. Wampler, on the very excellent presentation of the matter of the Interior's activities. As you can see, the Department of Interior is one of the major Federal water pollution controls of water resources agencies and has a vital interest in this area.

Are there any comments or questions?

MR. CLEARY: Mr. Chairman, may I make a few comments?

I simply wanted to indicate that the measures that Mr. Wampler set forth for the Bureau of Mines with respect to ameliorating the mine drainage problem, I think the record might indicate that those measures that are set forth are precisely those which were enunciated by the eight states some years ago and I think for the first time was set into form for practical means whereby we might attempt familiarization, and I think that the eight states have demonstrated that respect. Certainly very sympathetic, and in fact, imaginative development of these practical means which heretofore in the Ohio Valley I think we should remind each other that none of our states are actually affected by acid drainage in the enunciation of these principles that Mr. Wampler has set forth. There was no basis in the states for requiring control.

Now, that situation has changed. That is to the effect that we acknowledge that there are some practical means available.

I would only comment further with respect, Mr. Wampler, to the recreational opportunities. On the one hand, yesterday we heard witnesses, notably the Mayor of Youngstown and also Congressman Kirwan, saying that here a decision had to be made. Some years ago locally, fish factories -- you might take the liberty of using that term -- and the people made the decision that to maximize their opportunities in this valley they would prefer to spend their money as they did in building these reservoirs and utilize the Mahoning as the workhorse. That was a local decision and it was backed up with local funds and I am a little uncertain with respect to what the anticipation may be in terms of planning on the degree of cleanliness in the Mahoning River.

Is it expected to support, for example, a commercial fishery? Here again, we run into the matter of what are the maximum or the optimum, I may say, uses of the river and, as I say, I am -- I don't know what the criteria will be for this sort of thing, but the implications I get from the fish and wildlife service commentaries that you have quoted here may be that efforts ought to be made to restore this to a fishing stream, commercial fishery, and so forth and from testimony we heard yesterday, why, local decisions seem to indicate otherwise.

I just wanted to make those comments in view of the fact that here we have on one hand some implications that things ought to be, abatement programs ought to be carried out to the point of fish -- and yesterday they say the decision was made that fish are less important than people. I was simply commenting along those lines, Mr. Wampler.

I do appreciate the fine resume you provided for us. Thank you.

MR. WAMPLER: Mr. Cleary, I think I might add that the interests of commercial fisheries is in the Ohio River basin as a whole and they have activated some interests.

Now, in trying to see what potential, inasmuch as this particular over-all river basin would yield, and I think in order to keep their interest in general terms, they have included all of the sub areas as well and I am sure that this analysis is not to the state where they would be deciding this.

Thank you.

CHAIRMAN STEIN: Are there any further comments or questions? If not, thank you, Mr. Wampler.

Mr. Poston.

MR. POSTON: I would like to call next on Mr. Walter Brazon with the Corps of Engineers from Pittsburgh District Office. Mr. Brazon.

MR. BRAZON: Mr. Chairman, members of the conference: My name is Walter Brazon. I am with the U. S. Army Engineers District, Pittsburgh,Pennsylvania. The Pittsburgh District has prepared a statement to be --

CHAIRMAN STEIN: The reporter can't hear you.

MR. BRAZON: The statement is entitled The Responsibilities and Program of the Corps of Engineers in the Mahoning River Basin as Related to Water Quality and Water Supply.

The Federal Water Pollution Control Act, Public Law 660, as amended by Public Law 87-88 in 1961, Section 2 (b), provides authority to the Corps of Engineers to consider in the planning of any reservoir inclusion of storage for regulation of stream flow for the purpose of water quality control. Where storage for regulation of stream flow is made available, the costs of water control features are to be determined and where the beneficiaries can be identified they are to be assessed a portion of the cost commensurate with the benefits received. However, if the benefits are widespread or national in scope, the costs of such features shall be nonreimbursable.

By this legislation, there is now a direct provision for inclusion of storage for regulation of stream flow for purposes of water quality control. Before providing such storage, however, it is expected that primary effort in water pollution abatement should be oriented toward the reduction or elimination of polluting wastes at the source by waste treatment plants or other means. Dilution is not to be considered a substitute for waste removal but should be looked upon as a supplement to a program of adequate treatment.

Where storage for municipal or industrial water supply is made available by multi-purpose projects, water users are required to pay the costs allocated to such storage. The water supply Act of 1958 (Title III, Public Law 85-500), approved 3 July 1958, provides authority to

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the Corps of Engineers to include municipal and industrial water supply storage for immediate and anticipated future demand in any reservoir project, provided state or local interests contract or give assurances that they will contract for the use of such storage.

Basin Water Supply Storage.

Major water supplies in the Mahoning River basin are now obtained directly from reservoir storage or from stream flow as augmented by such storage. The first such development was made by the Ohio Water Service Company when it constructed Lake Hamilton in 1905. This company has continued its program of reservoir construction and operation and now has eight reservoirs in its system.

The City of Youngstown a few years later provided Milton Reservoir to augment stream flow for water supply purposes. Construction of Milton Dam was initiated in 1916 and storage in the reservoirs was begun in 191[illegible]. Primarily, the project provided for augmentation of low river flows with some flood control. No provision was made for direct water supply distribution.

In 1926, the Mahoning Valley Sanitary District was formed and, in 1929, began construction of Meander Reservoir for municipal water supply purposes. The dam was completed and water supply storage began in 1931.

The Corps of Engineers constructed Berlin and Mosquito Creek Reservoirs during the period 1941-1944 to provide flood protection and low water-augmentation to aid World War II industrial production. They were put in operation in July 1943 and April 1944, respectively. Under contract arrangements with the United States, municipal water supply storage was set aside at Mosquito Creek Reservoir for the City of Warren and at Berlin Reservoir for the Mahoning Valley Sanitary District.

The City of Alliance, for many years, obtained its water supply directly from the Mahoning River above a dam within the city limits. Because of pollution and difficulty encountered in treatment of this water, a dam was built on Deer Creek and put in operation in 1954. It provides the city with an assured supply of six million gallons per day.

Low Flow Regulation Program.

The low flow regulation program in the Mahoning River basin of Ohio includes the municipally developed Milton Reservoir, the two existing Federal projects, Berlin and Mosquito Creek, and the Corps of Engineers reservoir now being constructed on the West Branch, Mahoning River. A contribution toward the cost of the latter project commensurate with the low flow regulation function is being made by Trumbull and Mahoning Counties.

In the adjoining Shenango River basin the Shenango River Reservoir, now under construction by the Corps of Engineers, will complement the Commonwealth of Pennsylvania's Pymatuning Reservoir, the existing multipurpose reservoir in the basin. As its primary objective, the Shenango Reservoir will supplement Pymatuning Reservoir in providing flood control in the Shenango River Valley below Sharpsville, and in the Beaver and upper Ohio Rivers. Of secondary importance, it will provide effective seasonal storage for supplementing the Pymatuning Reservoir in augmenting the low flows in the Shenango and Beaver Rivers.

Berlin Reservoir has a maximum storage capacity of 33,600 acre-feet in winter and 56,600 acre-feet in summer reserved for storage of excess runoff for subsequent release to increase low flows in the Mahoning River and for direct water supply. Berlin Reservoir was built at a total cost, all Federal money, of $6,444,000.

Mosquito Creek Reservoir has a maximum capacity reserved for low-water regulation and water supply of 80,400 acre-feet in the summer and 69,100 acre-feet in the winter. Mosquito Creek Reservoir was built at a total cost of $4,035,000, all Federal money.

West Branch, Mahoning River Reservoir, is now under construction. Its total cost will be about 15.3

million dollars. Of that sum, 5.2 million dollars for low-water flow regulation is paid by local interests. Mahoning County's share is $3,449,842 and Trumbull County's share is $1,750,158. The maximum capacity reserved for low-water storage in summer is 52,900 acre-feet and in winter 41,700 acre-feet.

Prior to construction of Berlin and Mosquito Creek Reservoirs, the average of the minimum monthly low flows over the period of record was 125 c.f.s. Flows as low as 28 c.f.s. had occurred at Youngstown. After Berlin and Mosquito Creek Reservoirs were placed in operation, the flow on the same basis has averaged 275 c.f.s. When West Branch, Mahoning River Reservoir is completed, it is expected that flows at Youngstown will average 325 c.f.s., again on the same basis.

In order to compare storage cost with other reservoirs, the following information is provided:

Reservoir	Total Storage Acre-Feet	Total Cost Per Acre-Foot
Berlin	91,200	$ 70.65
Mosquito	104,100	38.75
West Branch, Mahoning River	78,700	194.40

The Shenango River Reservoir is scheduled for completion in the late fall of 1966 at a total estimated Federal cost of $34,800,000. The flow regulation storage available in the summer will be 29,900 acre-feet. This reservoir storage will augment the minimum discharge in the Shenango and Beaver Rivers, as currently regulated by the Pymatuning Reservoir operation, by 50 c.f.s. during May and October and by 100 c.f.s. from June through September.

CHAIRMAN STEIN: Thank you, Mr. Brazon.

Are there any comments or questions? If not, thank you very much, sir, for your presentation. Mr. Poston.

MR. POSTON: I would like to ask if there are any other Federal agencies here today who care to make a statement? The Soil Conservation Service had indicated that they would make a statement. I have not talked to anyone today. The Soil Conservation Service has already left their statement which was submitted to the reporter.

This concludes the part of the other Federal agencies and now the Public Health Service will present their narrative of the part which has been prepared for this conference. I can't resist, after the fine presentations yesterday, to tell you a little bit about the national interest in water.

President Johnson recently, in his State of the Union Message, indicated that we must stop poisoning our rivers. He talked about water pollution in several of his other talks, and most recently in his talk on America-the-Beautiful, he indicated that we must prevent pollution from occurring rather than abating pollution after it has occurred. He is in sympathy with this theory and I think that there is already legislation in our Congress. Our Congress is greatly interested and has been interested in the matter of water resources and particularly water pollution control.

I would like to review with you -- first I might say that Congress presently has a bill before them. This bill has already gone through the Senate and passed with a vote of some 68 to 8, this is Senate Bill 4. This is the first bill that came before the Senate in this present session of Congress.

This bill presently is to be heard, have a hearing in the House of Representatives. Congress, since 1948, has been increasingly interested and has passed several amendments to the Water Pollution Control Act to this time and it appears that now they will pass additional amendments.

The Federal Water Pollution Control Act provides tools, tools that will help in this abatement program.

It will help the state agencies which Congress recognizes as having the primary responsibility for control of water pollution. These tools I would like to elaborate on a little bit on how they help you here in the Mahoning Valley and how they are utilized to help in this matter of water pollution.

First off, we have a tool of grants, and these grants are given to the State Water Pollution agencies and to the interstate water pollution agencies. The Federal grants amount to some 1.4 million dollars over the period of this Act since 1956 to the State of Ohio Water Pollution Control Board to help them extend and expand their program. About 1.6 million dollars has been given to the Pennsylvania Sanitary Water Board to help them extend and expand their program and over $940,000 has been provided to the Ohio River Valley Sanitation Commission to help them in their over-all program of pollution abatement.

The grants additionally are provided to municipalities to help them construct sewage treatment plants and interceptor sewers and in this Mahoning River interstate area, I would say that there have been 3.9 million dollars given to communities as grants to help them in this abatement program. This has been for some 16 plants, total construction cost of some 14.6

million dollars.

We think that this has been a decided assistance in this pollution program.

Another area where we are interested in and another tool that is available to industry, to the states, to industries, is in the area of research. Research to assist in solving water pollution problems, and we have the Sanitary Engineering Center located in Cincinnati where they do the major work for the Public Health Service in this area of water pollution, water supply, and pollution control. This Center being located as it is in Ohio, Ohio probably reaps the major benefits from their activities in terms of assistance in research pertaining to the area.

Congress has also decided that this isn't enough and they have provided for seven regional research laboratories, one of which will be located in Ann Arbor, Michigan, and it is anticipated that there will be some 150 people employed just to do research on this problem of water supply and pollution control.

Another area is comprehensive planning and it is felt that it is needed to develop long-range plans. President Kennedy said that he wanted these completed by 1970. I think it will require to 1975 to complete these comprehensive programs for all of the major river basins in the country. Such study is being made by the Public

Health Service in the Ohio River basin and this study is presently under way. I might say that these comprehensive studies have been cooperating with the state agencies, with the interstate industries, and municipalities involved in these programs are very well accepted by the state and the local agencies and by industry.

We come now to another tool in our program and that's why we are meeting here today, and that is the enforcement activities of our water pollution control programs, and we have for purposes of pointing out the conditions as we have seen them and as our technical people from the Sanitary Engineering Center who have prepared this report for us to see those, and we have here today Mr. F. W. Kittrell who is going to start off this discussion and presentation and he will talk about our main stream investigation plan, and then followed by Mr. Hayse Black, industrial waste expert; Mr. Ken Mackenthun, biologist; Mr. Graham Walton, water supply investigator and expert; Mr. Maurice LeBosquet, who you heard about yesterday and who had a part in the preparation of this report will appear in sequence.

I would like to say -- make one other comment and that is that I view this river as a kind of a living thing; a thing that we can expect to work for the people in this area, work for you.

I heard the comments yesterday about how the river is used in major purpose, but then I also heard that they are thinking of still further uses for this river, namely, navigation. And I am sure that the people in this community and the other communities nearby will look to this river for the capabilities which it has for the area. I think this river is to serve the people in their certain way of life.

I would like to call on Mr. Kittrell now to start our presentation. Mr. Kittrell.

MR. KITTRELL: Mr. Chairman, conferees, ladies and gentlemen: I will present the report which Mr. Poston has called for. I would like to say that there will be a few departures from the report as prepared. First I will cut out some of the material that I do not consider essential in the interests of saving time. Secondly, there are a few errors in the report which I would like to call attention to and correct as I go along.

CHAIRMAN STEIN: Mr. Kittrell, do you want the whole report as prepared put in the record as read or will you delete a portion?

MR. KITTRELL: I would like the whole report included in the record.

CHAIRMAN STEIN: That will be done without objection but you better make sure that the reporter gets the corrections.

MR. KITTRELL: And finally, we received additional data on stream conditions from the Ohio Health Department while the report was in process of reproduction, and I have a few places in the report where I would like to insert some comments on the additional data that we have received.

CHAIRMAN STEIN: Be sure you indicate when that is done for the purpose of the record.

MR. KITTRELL: Introduction: On the basis of reports, surveys, or studies, having reason to believe that pollution from sources in Ohio was endangering the health or welfare of persons in Pennsylvania, and in accordance with Section 8 of the Federal Water Pollution Control Act, as amended (33 U.S.C. 466 et seq.), the Secretary of Health, Education, and Welfare called a conference of the States of Ohio and Pennsylvania, the Ohio River Valley Water Sanitation Commission, and the Department of Health, Education, and Welfare, on interstate pollution of the Mahoning River, to be held in Youngstown, Ohio, on February 16, 1965.

This report on interstate pollution of the waters of the Mahoning and Beaver River system is based on previous reports; official records of the Public Health Service; information furnished by interested state and local agencies, individuals, and industries; and data obtained by the Public Health Service from limited field studies conducted during January 1965, involving biological aspects, industrial water supplies and wastes, municipal water supply, and selected indicators of stream quality.

The cooperation of the numerous agencies and individuals is gratefully acknowledged.

The Area.

The Mahoning River drains an area of 1,131 square miles (See Figure I), of which 1,076 square miles are in northeastern Ohio, and 55 square miles in western Pennsylvania. The headwaters of the Mahoning River are in the vicinity of Alliance, Ohio. It then flows northeasterly to Warren, Ohio, where it continues southeasterly through Youngstown, Ohio, crossing the state line about nine miles downstream from Youngstown. The Mahoning River flows through Pennsylvania for a distance of about 12 miles, before it joins the Shenango River near New Castle, Pennsylvania, to form the Beaver River. The Beaver River then flows in a southerly direction about 20 miles, before it becomes confluent with the Ohio River at Rochester, Pennsylvania.

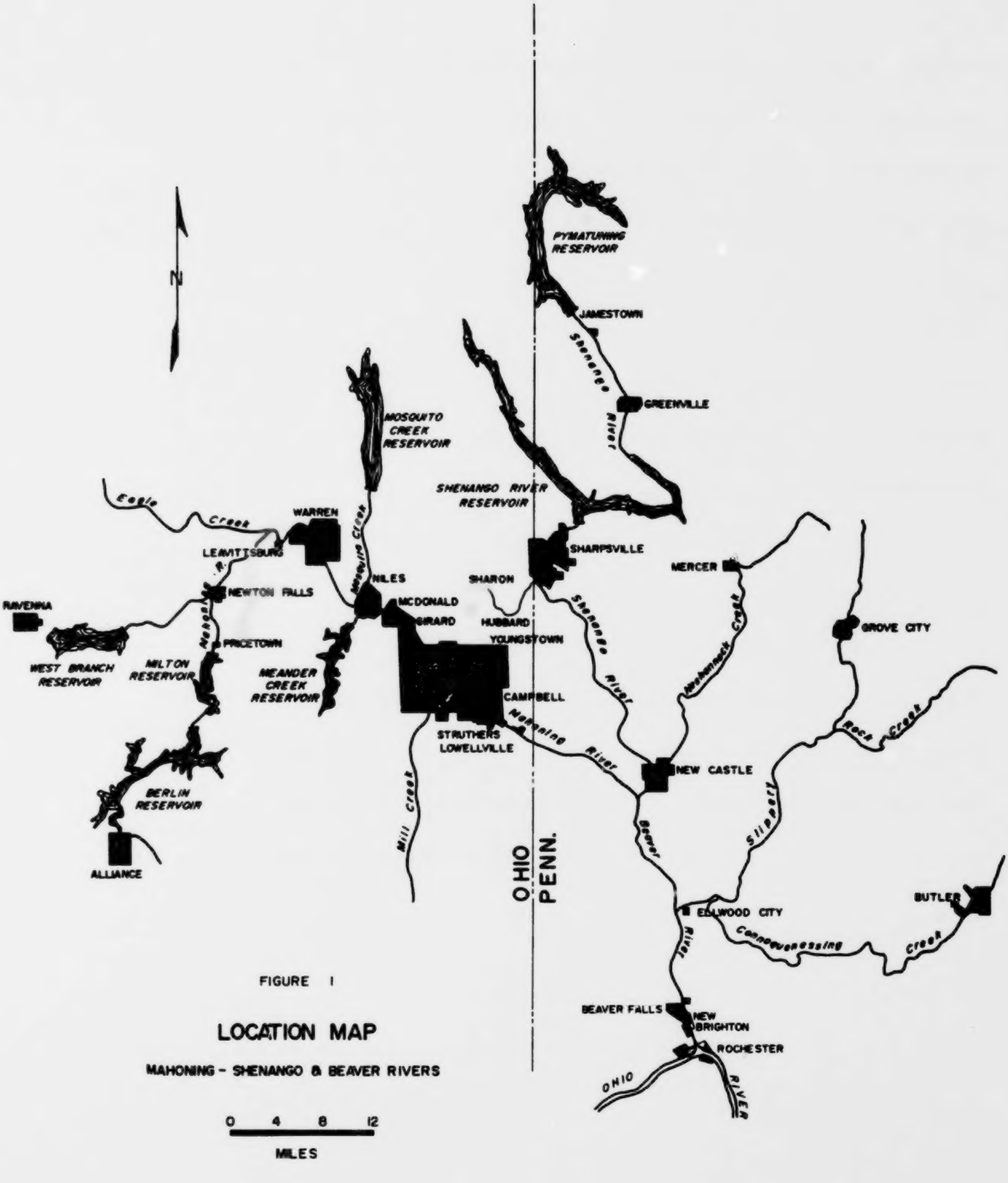
Little Yankee Creek receives wastes from metal processing industries in Hubbard, Ohio, just north of Youngstown, and flows northeast across the Ohio-Pennsylvania state line to join the Shenango River southwest of Sharon.

Pennsylvania. Also southwest of Sharon the Shenango River, carrying the wastes from the Sharpsville-Sharon area, loops across the Pennsylvania-Ohio state line into Ohio for about one-half mile and then returns to Pennsylvania.

The Beaver River drainage area, including the tributary areas of the Mahoning and Shenango rivers, is about 3,145 square miles. The Shenango River drains 1,080 square miles of which are in Ohio, and 795 square miles in Pennsylvania.

The economy of the region is heavily dependent on manufacturing. The percentage of total employment engaged in the manufacture of primary metals is 12 times greater than the national average. Much of the industry is located along the 25-mile reach of Mahoning River between Warren and Lowellville, Ohio. Other important industrial areas are in and near Sharon and New Castle, Pennsylvania.

(See next page.)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PYMATUNING RESERVOIR
JAMESTOWN
Shenango River
GREENVILLE
MOSQUITO CREEK RESERVOIR
SHENANGO RIVER RESERVOIR
Eagle Creek
WARREN
Mosquito Creek
LEAVITTSBURG
SHARPSVILLE
MERCER
SHARON
NILES
RAVENNA
NEWTON FALLS
MCDONALD
GIRARD
HUBBARD
YOUNGSTOWN
Mahoning R.
PRICETOWN
GROVE CITY
WEST BRANCH RESERVOIR
MILTON RESERVOIR
MEANDER CREEK RESERVOIR
Shenango River
Neshannock Creek
Rock Creek
CAMPBELL
STRUTHERS
LOWELLVILLE
Mahoning River
NEW CASTLE
BERLIN RESERVOIR
Slippery
ALLIANCE
Mill Creek
Beaver
OHIO
PENN.
ELLWOOD CITY
BUTLER
River
Connoquenessing Creek
BEAVER FALLS
NEW BRIGHTON
ROCHESTER
OHIO RIVER
0 4 8 12
MILES

FIGURE 1

LOCATION MAP

MAHONING - SHENANGO & BEAVER RIVERS

Water Uses. Reservoirs.

As shown on Table 1, several major reservoirs now operating or under construction are located in the Beaver River basin. The Corps of Engineers has constructed four of these reservoirs, including Berlin, Mosquito Creek, and West Branch Reservoirs, in the Mahoning River watershed, and Shenango River Reservoir in the Shenango River basin. These four reservoirs provide over 466,000 acre-feet of storage capacity for flood control, water supply, and stream flow regulation. Flow regulation in the Mahoning River has been designed to meet water quality objectives which are highly complicated by the many uses made of the stream, such as the assurance of industrial water supply, for the control of the temperature of industrial supplies, and for the disposal of municipal and industrial wastes.

Milton Reservoir, located on the Mahoning River, was constructed in 1917 by the City of Youngstown and private interests for flow regulation purposes. This reservoir is now operated in coordination with Berlin Reservoir. Meander Creek Reservoir, on a tributary of the Mahoning River, was constructed by the Mahoning Valley Sanitary District in 1931. This reservoir serves as a source of municipal water to communities served by the sanitary district, including Youngstown, Niles and other communities in this general area. Arrangements have been made to augment the capacity of this reservoir by diverting water by pipeline from Berlin Reservoir. Mosquito Creek Reservoir, located on Mosquito Creek, a tributary of the Mahoning River, serves as a source of water for the City of Warren, Ohio. Pymatuning Reservoir was developed by Pennsylvania in 1933. It is located in the headwaters of the Shenango River, upstream of the Shenango River Reservoir. This reservoir serves a number of purposes, and is used intensely for recreation.

There are several important smaller reservoirs in the basin, such as Mill Creek, Yellow Creek, Dry Run and others that are operated for water supply purposes.

(See next page.)

Table 1

Major Storage Reservoirs
Beaver-Mahoning and Grand River Basins

Reservoir	Date Completed year	Location of Dam	Drainage Area square miles	Storage Capacity, acre-feet Water Supply	 Flow Regulation	 Total[a]	Owner or Operator
Milton	1917	Mahoning River 5 miles above Newton Falls	276	-	-	29,150	City of Youngstown
Berlin	1943	Mahoning River 35 miles above Warren	87	19,400	58,800	91,200	Corps of Engineers
Pymatuning	1933	Shenango River 1.6 miles above Jamestown	158	19,400	159,900	198,200	Commonwealth of Pennsylvania
Meander Creek	1931	Meander Creek 2 miles above mouth	249	30,800	-	32,400	Mahoning Valley Sanitary District
Mosquito Creek	1944	Mosquito Creek 9 miles above mouth	97	11,000	69,400	104,100	Corps of Engineers
West Branch	Under Construction	West Branch 11 miles above mouth	81	-	52,900	78,700	Corps of Engineers
Shenango River	Under Construction	Shenango River 2 miles above Sharpsville	589	-	30,000	192,400	Corps of Engineers
		Total	1,537	80,600	371,000	726,150	

[a] Includes storage for silt, flood control, and other purposes.

Municipal Water Supply.

The Mahoning River was used as a source of municipal water for the Warren-Niles-Youngstown area for many years, but was abandoned because of gross pollution, and the increased demand for water. Supplies were developed in upland tributaries that were relatively free of pollution.

On the lower Beaver River, the Beaver Falls Municipal Authority and New Brighton water plants use water pumped from pools formed by lowhead dams and serve an estimated 65,000 persons. Water supplies from this source are difficult and costly to treat. High iron and manganese concentrations, oils, phenol-like and other taste and odor producing substances, are some of the causes of water treatment complications.

Industrial Water Supplies.

Industrial between Warren and Lowellville, Ohio, use large quantities of Mahoning River water. The largest use is for industrial cooling purposes, primarily in the production of basic iron and steel in this highly developed industrial complex. Average industrial use of Mahoning River water by the principal firms has been reported to be in excess of 1,500 mgd during peak production periods. As the average annual flow of the Mahoning River at Youngstown is less than half this quantity, it is obvious that reuse of stream flow is often very high.

Recreation.

Water-oriented recreation activities have increased rapidly across the nation, especially near centers of pollution. The great recreational potential of the Mahoning and Beaver Rivers for pursuits such as boating, swimming, and fishing, has not been realized, under present circumstances because of the high degree of pollution that exists in these waters.

The main stem of the Mahoning River, from Warren, Ohio, to the confluence with the Shenango River in Pennsylvania, is so polluted that it is practically uninhabitable for fish. Thick black sludge deposits, floating solids, greases, and oils are prevalent throughout, causing the stream to be unusable for recreational activities.

Farther downstream on the Beaver River, and in the general vicinity of the Beaver Falls area, there is a limited fisher for carp, bullheads, and suckers, and the river recently has been stocked with black crappies, bass, and channel catfish. This is indication of downstream improvement in the stream quality to support fish, although the sanitary quality remains poor. Despite this fact, some boating and aquatic sports take place in the pools created by the dams in this area.

Sources of Municipal Water.

A summary of the principal municipal waste discharges to the stream between Warren, Ohio, and the mouth of the Beaver River is given in Table 2. The bacterial content and biochemical oxygen demand of the waste discharges are expressed as population equivalents; one population equivalent is that quantity of a constituent that would be contained in the daily untreated sewage produced by one person.

Bacteria.

Coliform bacteria that originate in the intestines of warm-blooded animals, including man, are normally used as indicators of bacterial pollution and accompanying health hazards. The estimated bacterial loadings discharged from principal municipal sources are shown on Table 2 and Figure II.

All of the principal municipal sources of sewage receive some treatment at this time, or have treatment facilities under construction. The total sewered population of the principal sources of municipal wastes in the study area is about 467,000 and the waste treatment facilities have a capability of reducing the bacterial content of the sewage about 61 percent (assuming that the Youngstown primary waste treatment plant, now being constructed, is operating). Of the estimated total waste load of 184,000 bacterial population equivalents (BPE) originating in the study area, 78 percent is discharged in Ohio and 22 percent in Pennsylvania.

Biochemical Oxygen Demand.

Oxygen-demanding organic waste loads, discharged from municipal systems to the Mahoning River by communities from Warren, Ohio, to the Pennsylvania state line, are estimated to have a population equivalent of 200,400 after treatment. This constitutes about 71 percent of the total organic wastes discharged in the study area via municipal waste outfalls (see Figure III and Table 2).

A stream that is excessively depleted of oxygen, because of overloading with oxygen-demanding wastes will not support a good fish population and if the dissolved oxygen is totally depleted, the decomposition of organic matter will produce offensive odors.

(See next page.)

Table 2
Estimated Characteristics of Municipal Wastes

Jurisdiction	State	Receiving Stream	Type of Treatment	1960 Population	Population Served	POPULATION EQUIVALENTS				River Miles
						Bacteria		Oxygen Demand		
						Number	% of Total	Number	% of Total	
Warren	Ohio	Mahoning River	Primary	59,648	53,000$^{(1)}$	26,500	17.8	47,400	20.5	21-35.3
Niles	Ohio	Mahoning River	Primary	19,545	26,000$^{(1)}$	13,000	8.7	11,900	5.2	21-29.5
McDonald	Ohio	Mahoning River	Primary	2,727	2,730$^{(1)}$	1,300	0.9	1,000	0.4	21-27.8
Girard	Ohio	Mahoning River	Primary	12,997	12,995$^{(2)}$	6,500	4.4	8,500	3.7	21-23.6
Mahoning Co. Austintown S.D.	Ohio		Youngstown	(1400)	(1400)$^{(2)}$					
Mahoning Co. Boardman S. D.	Ohio	Mahoning River	Secondary	(12,250)	12,250$^{(2)}$	3,000	2.0	1,800	0.8	
Mahoning Co. Pine Hollow S.D.	Ohio		Youngstown	(180)$^{(2)}$						
Youngstown	Ohio	Mahoning River	Primary	166,689	168,270$^{(2)}$	84,100	56.4	109,400	47.3	21-19.1
Campbell	Ohio	Mahoning River	Primary	13,406	14,400$^{(1)}$	7,200	4.8	7,900	3.4	21-15.3
Poland	Ohio		Struthers	2,766	(2,765)$^{(2)}$					
Struthers	Ohio	Mahoning River	Primary & Cl.	15,631	18,400$^{(3)}$	1,800	1.2	12,000	5.2	21-13.9
Lowellville	Ohio	Mahoning River	Primary	2,055	2,200$^{(1)}$	1,100	0.7	470	0.2	21-11.4
Union Twp.	Pa.		New Castle	7,161	(x) $^{(2)}$					
New Castle	Pa.	Mahoning River	Primary & Cl.	44,790	47,000$^{(2)}$	4,700	3.1	30,500	13.3	21-3
Mahoning River Total				361,245	357,245	149,200	100	230,870	100	
	Ohio			309,294		144,500	96.8	200,370	86.8	
	Pa.			51,951		4,700	3.2	30,500	13.2	
Hubbard	Ohio	L. Yankee Creek	Secondary	7,137	7,135$^{(2)}$	700	12.4	1,500	10.2	21-28.6
Sharon	Pa.	Shenango River	Secondary	25,267	25,270$^{(3)}$	500	8.8	3,800	25.8	21-25
Farrell	Pa.	Shenango River	Secondary	13,793	15,000$^{(2)}$	3,700	65.5	8,000	54.4	21-23
Hickory Twp.	Pa.	Shenango River	Secondary	12,635	4,000$^{(2)}$	100	1.8	600	4.2	21-21
West Middlesex	Pa.	Shenango River	Primary	1,301	1,300$^{(2)}$	650	11.5	800	5.4	21-12
Shenango River Total				60,133	52,705	5,650	100	14,700	100	
	Ohio			7,137		700	12.4	1,500	10.2	
	Pa.			52,996		4,950	87.6	13,200	89.8	

Table 2 (Cont.)

Estimated Characteristics of Municipal Wastes

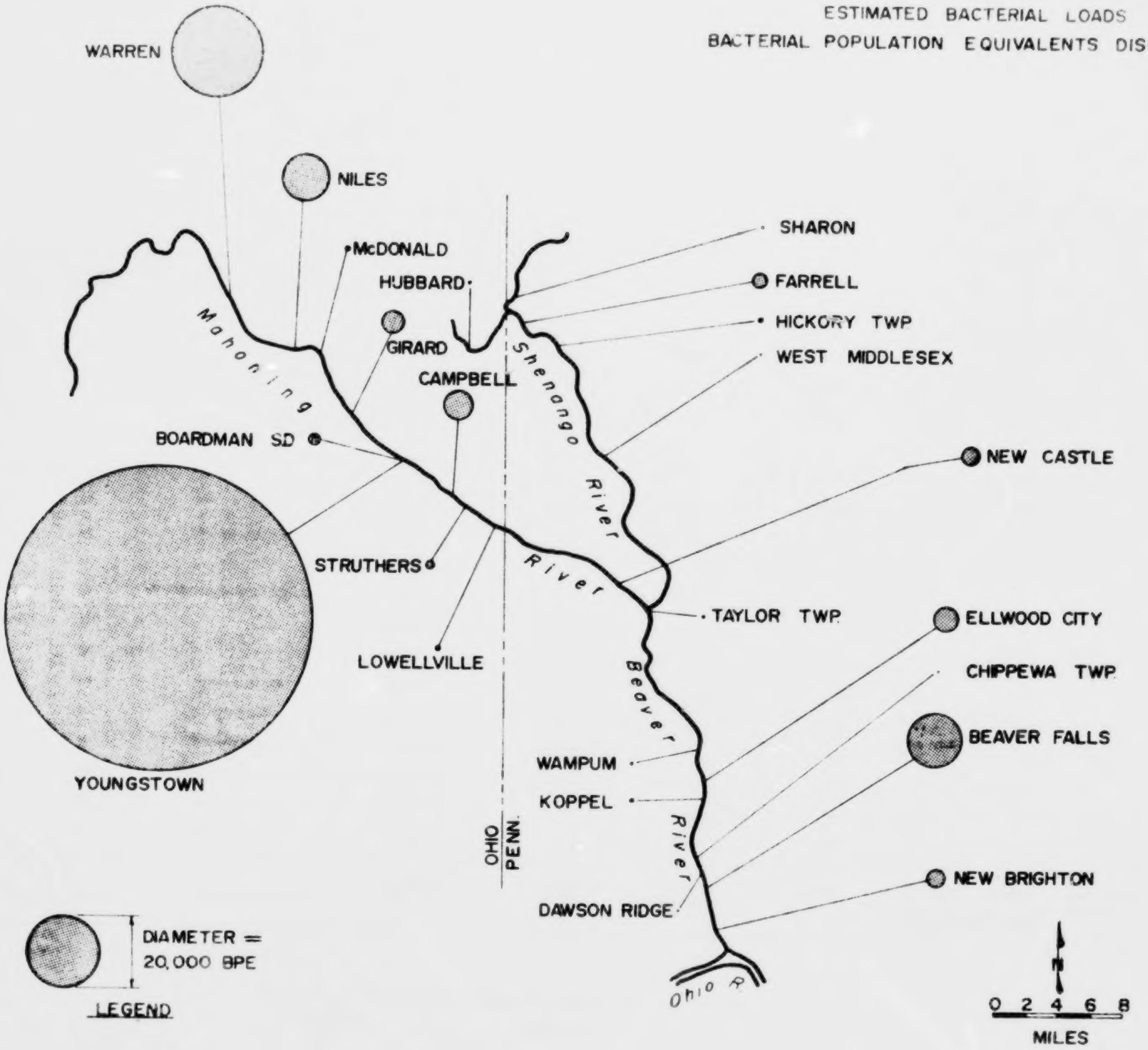
Jurisdiction	State	Receiving Stream	Type of Treatment	1960 Population	Population Served	POPULATION EQUIVALENTS Bacteria Number	POPULATION EQUIVALENTS Bacteria % of Total	POPULATION EQUIVALENTS Oxygen Demand Number	POPULATION EQUIVALENTS Oxygen Demand % of Total	River Miles
Taylor Twp.	Pa.	Beaver River	Primary	1,402	900(2)	450	1.6	600	1.6	21
Wampum	Pa.	Beaver River	Primary	1,085	700(2)	350	1.2	450	1.2	14
Ellwood City	Pa.	Connoquenessing Cr.	Primary	12,413	14,000(2)	7,000	24.5	9,100	24.5	12-2
Koppel	Pa.	Beaver River	Primary	1,389	1,390(3)	700	2.5	900	2.5	11
Chippewa Twp.	Pa.	Brady River	Primary	6,051	75(2)	40	0.1	50	0.1	7-2
Dawson Ridge	Pa.	Beaver River	Primary	550	40(2)	20	0.1	30	0.1	6
Patterson Hts.	Pa.		Beaver Falls	817	(x) (2)					
Patterson Twp.	Pa.		Beaver Falls	2,930	(x) (2)					
West Mayfield	Pa.		Beaver Falls	2,201	(x) (2)					
White Twp.	Pa.		Beaver Falls	1,437	(550)(2)					
Beaver Falls	Pa.	Beaver River	Primary	16,240	30,000(2)	15,000	52.5	19,500	52.5	5
New Brighton	Pa.	Beaver River	Primary	8,397	10,000(2)	5,000	17.5	6,500	17.5	2
Total Beaver River (All in Pa.)				54,911	57,105	28,560	100	37,130	100	
Total for Basin				476,289	467,055	184,010		283,300		
	Ohio			309,294	65%	144,500	78	200,370	71	
	Pa.			166,995	35%	39,510	22	82,430	29	

(1) From Sewage Treatment Plant Operation and Maintenance Questionnaire, Reg. V.
(2) From 1962 Inventory of Municipal Waste Facilities.
(3) Estimated from 1960 population figures.

FIGURE II

ESTIMATED BACTERIAL LOADS

BACTERIAL POPULATION EQUIVALENTS DISCHARGED


WARREN
NILES
McDONALD
HUBBARD
GIRARD
CAMPBELL
BOARDMAN SD
YOUNGSTOWN
STRUTHERS
LOWELLVILLE
Mahoning
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Shenango
River
Beaver
River
Ohio R
OHIO
PENN.
SHARON
FARRELL
HICKORY TWP
WEST MIDDLESEX
NEW CASTLE
TAYLOR TWP.
ELLWOOD CITY
CHIPPEWA TWP.
BEAVER FALLS
WAMPUM
KOPPEL
DAWSON RIDGE
NEW BRIGHTON
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DIAMETER = 20,000 BPE
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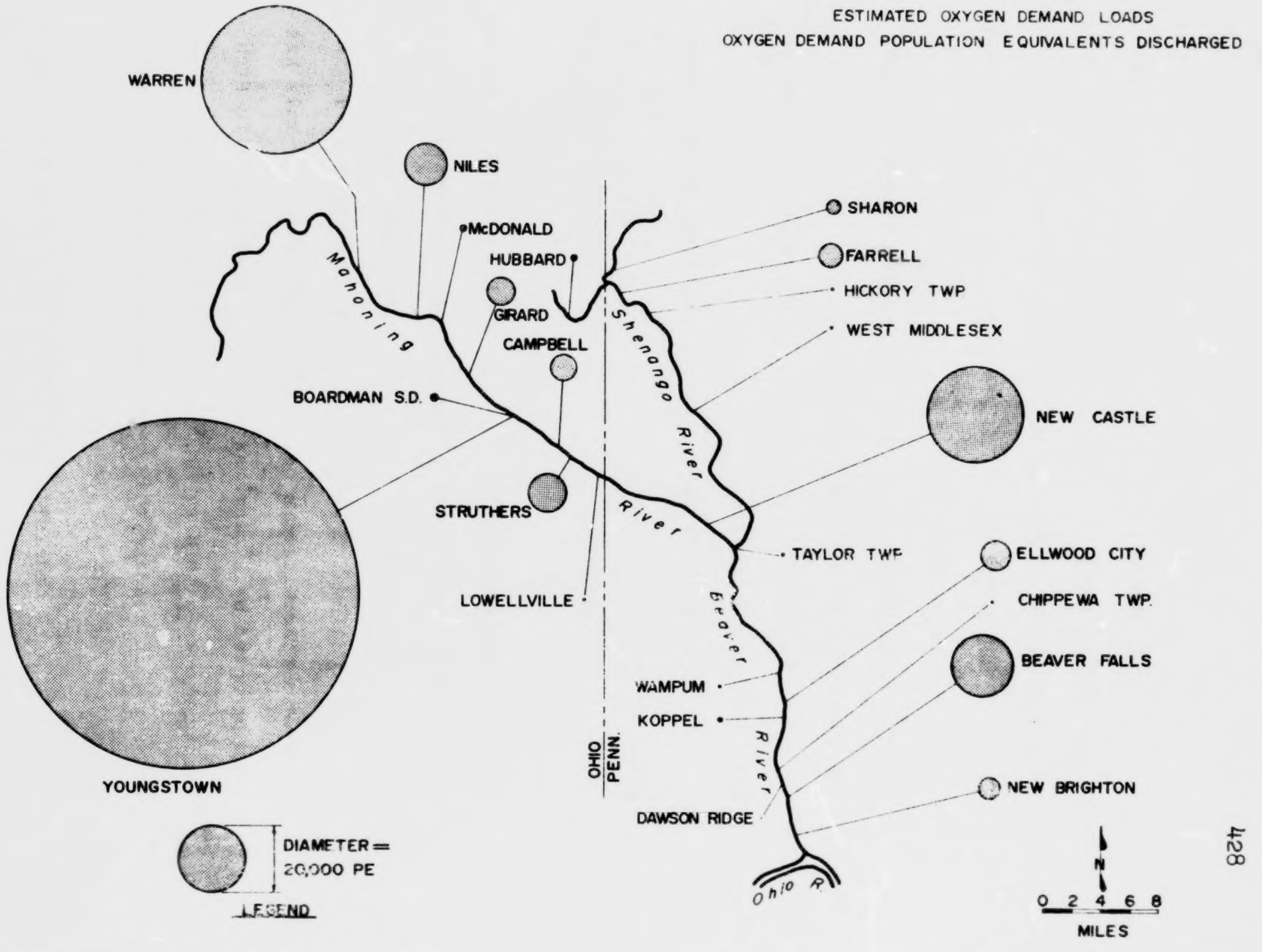
FIGURE III

ESTIMATED OXYGEN DEMAND LOADS
OXYGEN DEMAND POPULATION EQUIVALENTS DISCHARGED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NILES
McDONALD
HUBBARD
GIRARD
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BOARDMAN S.D.
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River
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HICKORY TWP
WEST MIDDLESEX
NEW CASTLE
TAYLOR TWP
ELLWOOD CITY
CHIPPEWA TWP.
BEAVER FALLS
WAMPUM
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MR. POSTON: Mr. Kittrell, on page 14 you talked about -- in the report it says 200,400. You commented 20,000. What is the correct figure?

MR. KITTRELL: 200,400 is correct; that was a slip on my part.

CHAIRMAN STEIN: Do you want to reserve the questions to the end?

MR. POSTON: I would prefer, but I will suit your pleasure.

CHAIRMAN STEIN: How long is your report going to be?

MR. POSTON: It will take approximately two hours.

CHAIRMAN STEIN: Well, I think we better delouse this. Let's see if anybody has any questions?

MR. POSTON: Are there questions?

CHAIRMAN STEIN: I have one that I want to have a clarification on. And I might say that this has been prompted by a conversation I had yesterday with Fred Waring who used to have Mr. Eagle's job in Ohio, and I am not sure, in reading this, what the situation is in Ohio. Maybe you can help me with it.

As I understand it, after the plants are to go in, the new treatment plants, there is some disinfection. Is this supposed to take place all year around or just in the summertime or intermittent periods?

MR. KITTRELL: My understanding of that is planned only for summer periods.

CHAIRMAN STEIN: Is this correct, for summer periods, or when needed?

Now again -- and I just raise this as a question that the conferees may consider -- if the stream is not used for recreational purposes, you won't necessarily have these recreational periods. As I understand this, as I say, this was based on a conversation with an old friend -- in fact, he said that when the program was set up, the thinking was to have this chlorination continuously. Has there been any change in their thinking, or if there has, should this be or what? I wonder, perhaps we can ask Ohio for its view on this, or Mr. Kittrell what he thinks about this.

MR. KITTRELL: Well it is my opinion that for the production of the bacterial quality at the Beaver Falls water plant, that chlorination year around would be desirable.

CHAIRMAN STEIN: Well, I think there is probably a lot closer agreement on this than maybe I thought. I am sure your thinking is all the same. Thank you.

Mr. Boardman.

MR. BOARDMAN: A little while ago you made a statement about admitting the entire report into the record and I was going to wait until you finished but, as you recall, yesterday when Dr. Wilbar made his statement, he made a specific request and nothing more was said about it.

I would again like to make that statement and ask each of the conferees for their views on this statement and that is that Secretary Celebrezze's conference call indicated the subject of the conference would be the interstate pollution of the Mahoning River. The Public Health Service report goes far beyond this question and also includes the following material presumably as a subject for discussion at this conference:

One waste sources in Pennsylvania on the Shenango River; two, waste sources in Pennsylvania on the Beaver River; three, alleged interstate pollution on Little Yankee Creek, a tributary of the Shenango River; four, alleged interstate pollution of the Shenango River below Sharon.

Since this material is not in any way pertinent to the question before this conference, it seems appropriate at this time to request that all this material be stricken from the record of this conference. We realize that in order to determine the effect on the Mahoning River that the quality of the Shenango immediately before its confluence with the Mahoning and the water quality of the Beaver River may have to be considered.

I do not wish to imply by my statement that all persons who are interested and concerned with waste sources on the Shenango or the Beaver are not free to obtain this information from the Pennsylvania Sanitary Water Board. This information is available to the Public Health Service and to anyone else who has legitimate interest in this information. This information does not appear to be a pertinent part of the subject of this conference and has nothing to do with any pollution that may flow over the Ohio-Pennsylvania line into the Mahoning River.

CHAIRMAN STEIN: Thank you, Mr. Boardman.

MR. POSTON: In order to be fair in our evaluations of the Mahoning River, you can see that there are tributaries, the Shenango, even tributaries to the Shenango which come from the State of Pennsylvania, but they do contribute to the total flow of the Beaver River and the Mahoning which comes from Ohio carrying the principal waste sources and is probably -- which is the concern of this conference -- requires a careful evaluation.

We would not like to construe that all of the wastes that come down as far as Beaver Falls comes from the Youngstown-Warren area, but we would like to show that there is a waste contribution from other areas so that we might be fair in our total evaluation of the problem.

MR. BOARDMAN: May I make an answer to

that question? We certainly realize, but the statement we pointed out, we realize you have to consider water quality at the mouth of the Shenango and its effect on the Beaver if you are going to compare effects of pollution.

What we are objecting to is the inclusion of information on specific waste sources in Pennsylvania, Shenango, waste sources in the Pennsylvania Shenango, waste sources on the Beaver. There is in Mr. Kittrell's statement interstate pollution of Yankee Creek and interstate pollution of the Shenango which we do not feel is a subject in this conference.

CHAIRMAN STEIN: Mr. Kittrell is shaking his head but I would like to make this comment. I don't know that we should get into the technical details here. I think you have to remember that this is a conference. Now, we have not made any rulings nor have there been any objections as to the germaneness of material put in by the various people making statements.

I think one of the key points in the conference is when the states or the Federal Government to the interstate agency makes a statement or their invitees, we allow them to make a determination of what is appropriate and what is not. The conferees then will be able to take that and make its own determination on the call of the conference.

Now, I would not attempt to dispute the views that you have expressed on the substantive matter. I think the Secretary of Health, Education, and Welfare did call a conference in the matter of pollution of the interstate waters of the Mahoning River but I do think that we should give every participant to the conference the courtesy we gave every other participant and that is the initial determination for germaneness and appropriateness to them, because if we are going to make these other judgments, I think this could very well have been questioned by many of the participants in the conference up to now.

MR. BOARDMAN: May I go just a little further then? When statements are made concerning the Shenango River and other statements, we didn't have very much of an opportunity to record a report on the Shenango. In our limited review, we have found errors in the information that has been presented especially on this table from which the bacterial contributions were indicated, and the treatment plants in Pennsylvania, the primary plants of chlorination. This allowance wasn't made at the table.

The figures are not correct but if the information is deleted on the Shenango, it will remove most of the errors that we found.

MR. POSTON: I think we would be very happy to include any corrections that we find indicated here.

MR. BOARDMAN: Our request is not for corrections, our request is for deletions. I would like to hear the comments from the other conferees on this request.

DR. ARNOLD: I have to admit that I have had this report such a short time that I haven't been able to give any great deal of study to it. This report, my own copy of this report was made available to me late last Thursday afternoon. In the Public Law, it states that the Secretary may call a conference on a pollution problem where a river from one state is flowing into another and may be endangering the health of the people in the other state.

I think primarily the Shenango River is a Pennsylvania river. I think what we are primarily concerned with here is the quality of the water at the state line.

CHAIRMAN STEIN: Does ORSANCO want to comment or not?

MR. WEAKLEY: Mr. Chairman, I think the observation of Mr. Boardman is quite appropriate that this is a conference called for the purpose of considering just one area.

Now, I think it would be out of order to go beyond that. I recognize that the Chairman has pointed out the rather broad privileges that have been given to other spokesmen in presenting material but this still seems to me that most of the material that has been presented by other spokesmen has pretty much been aimed at the Mahoning problem. And it seems to me that once you start going into areas beyond the Mahoning itself, that you are really broadening the base of the conference beyond not only what the call prescribed but what the other spokesmen have aimed their remarks towards themselves.

CHAIRMAN STEIN: I am not disagreeing with what you say, sir, -- I would not like to specify other groups here, or other statements made here -- but there have been statements by others here dealing with programs outside this area; achievements outside this area and the programs which do not materially affect the Mahoning River problem.

I think with this in mind as the sense of the Board, let's see if we can proceed, and if this gets to be an area where we have a problem, we can bring this up at the time. I think the feelings of the conferees are made clear and if there is any question you have on the appropriateness or the germaneness of a particular issue as it develops, you may raise that question.

These matters, of course, are matters of opinion and they differ. I have glanced at this report myself, sir, and on the basis of your criteria if you thought all the statements made heretofore were reasonably concerned with the Mahoning River problem, I don't know that this is any farther afield, but if it is at any particular point in the presentation, I would welcome the conferees coming in and we will see what we will do at that time.

I wonder if we could continue on that basis, if that's agreeable. Mr. Kittrell.

MR. POSTON: Is there any other question of Mr. Kittrell? Mr. Kittrell will be on a little bit later again. We will now hear from Mr. Hayse Black who will talk about sources of industrial waste.

MR. BLACK: Mr. Chairman, conferees, ladies and gentlemen: There are some errors in the part that I will present. They are not typographical errors, they are changes that have come to our attention, some of them as recently as yesterday. In making this statement, I am not unmindful of the fact that over the years I have worked with many of you people and in this contact have perhaps a better appreciation of the conditions observed in the Mahoning River than some of our other investigators. I hope that in making this statement no information will be revealed that will embarrass anyone.

Concerted effort has been made to interpret what we have seen, to understand what is going on, to appreciate what has been done, and to better understand what still needs to be done.

The streams under consideration drain one of the most highly industrialized areas in the United States. Some seven percent of this country's steel production is concentrated in the Mahoning River Basin. Production of iron and steel and fabrication of various steel products overshadow all other manufacturing in this area.

Cognizance is taken of the waste control measures and water pollution abatement programs that have been developed at the steel mills operating in the Warren-Youngstown area. However, residual steel mill wastes discharged to the Mahoning River are still cause for concern.

The principal industries discharging waste to the Mahoning River and its tributaries are listed in Table 3. This tabulated information indicates the types of wastes and the approximate volumes. Effluent data for most of these industries were not available.

Steel is produced from iron ore at the following mills:

Community	Name
Warren, Ohio	Republic Steel Co.
McDonald, Ohio	U. S. Steel Corp.
Youngstown, Ohio	Youngstown Sheet &

Community	Name
Youngstown, Ohio	Republic Steel Co.
Campbell, Ohio	Youngstown Sheet & Tube Co.

(See next page.)

Table 3

Data on Sources of Industrial Pollution Mahoning River & Tributaries

Name & Location	Process	Production	Water Use, mgd	Source of Water	Waste Volume, mgd		Treatment	Discharge to	CN #/day	Cr^{+6} #/day	F #/day	Temp. °F	Oil gal/day	Acid #/day	NH_3 #/day	Phenol #/day	Fe #/day	Susp. Sol. #/day	BOD #/day	Source of Data
					Cooling	Industrial														
Warren, Ohio																				
1. American Welding & Mfg. Co.	Welding & Assembly	X	0.10	Mahoning R. & Wells	0.10		None	Swander Cr.	-	-	-	X	X	-	-	-	-	X	-	1
2. Copperweld Steel Co. Aristoloy Div.	Prod. of Carbon & Alloy Steels from Scrap	35,000 tons/mo.	24.53	Mahoning R. & Warren	24.5	0.03	Cooling - Settling Ind. - Neut. & Settling	Mahoning R.	-	-	-	X	X	X	-	-	X	X	X	Visit
3. Denman Rubber Co.	Mfg. Tires, Tubes	Max. 2500 Tires/day	0.18	Wells	0.03	-	None	Mahoning R.	-	-	-	120	-	-	-	-	-	-	X	Visit
4. Pittsburgh Steel Co. Thomas Strip Div.	Cold Rolled Strip Steel	X	1.40	Mahoning R. & Warren	0.36	0.91	Cooling - None Ind. - Cn.Trt.(Alk. Chlor.)	Mahoning R.	X	-	-	X	X	X	-	-	X	X	-	1, 2
5. Republic Steel Corp.	Tin Plate, Hot & Cold Strips & Sheets, Galv. Sheets	X	119.5	Mahoning R. & Warren	74.6	44.9	Cooling - None Ind. - Clarif., Neut. & Settling Pits	Mahoning R.	X	X	X	X	X	X	X	X	X	X	X	1, 2
6. Sharon Steel Corp. Brainard Strapping Div.	Steel Strapping El. - Galv. Strip	X	0.12	Warren	0.11	0.0004	Cooling - None Ind. - Controlled Disch.	Red Run	X	X	-	X	X	X	-	-	X	X	-	1
7. Taylor-Winfield Corp.	Welding Machinery & Controls	X	0.057	Warren	0.05	50 g/d	None	Mahoning R.	-	-	-	X	X	-	-	-	-	-	-	1
8. Van Huffel Tube Corp.	Steel Tubing & Rolled Metal Shapes	X	0.07	Warren	0.05	400 g/d	Cooling - None Ind. - Chem. & Flotation	Red Run	X	X	-	X	X	X	-	-	X	X	-	1, 2
9. Warren Tool Corp.	Heavy Hand Tools, Railroad Tools	X	0.038	Warren	0.036	-	None	Red Run	-	-	-	X	X	-	-	-	-	-	-	1
Niles, Ohio																				
10. American Welding & Mfg. Co.	Steel Fabrication, Doors, Frames	X	0.037	Niles	0.036		None	Mahoning R.	-	-	-	X	X	-	-	-	-	-	-	1
11. Jones & Laughlin Steel Co. Conduit Div.	Steel Duct & Tubing	114 million ft. tubing & 2 million ft. duct	0.49	Niles	0.48		Alk. Chlor. for CN Destruction	Cr. to Mahoning R.	> 0.49	19	-	X	X	X	-	-	X	X	-	Visit
12. Mahoning Glass Plant Div. G.E. Co.	Glass Parts for Sealed Lamp Beams	X	0.033	Niles	X	To Niles Glass Plt.	None	Mosquito Cr.	-	-	-	X	3	X	-	-	-	X	-	Visit
13. Niles Glass Plant Div. G.E. Co.	Clear & Frosted Glass Envelopes	X	0.43	Niles	X	0.20	Lime Neut. & Settling	Mosquito Cr.	-	-	> 80	X	X	X	X	-	-	X	-	Visit
14. Nat'l Gypsum Co.	Fabr. of Metal Prod. Metal Lath	X	1.44	Niles	1.2	0.04	None	Mahoning R.	-	-	-	X	X	-	-	-	-	-	-	1
15. Reactive Metals, Inc.	Titanium Bars & Sheets Zirconium Tubing	Ti 400 T/mo. Zr 30-50 T/mo.	1.5	Niles	0.9	0.6 + Batch Dumps	None	Mahoning R.	-	-	18,000-19,000 #/mo in 3-5 Batch Acid Dumps	X	X	1,000 + 3-5 Batch Dump/mo.	-	-	-	X	X	Visit
16. Republic Steel Corp. Container Div.	Steel Containers	X	0.30	Niles	0.19	0.003	None	Mahoning R.	-	-	-	X	X	X	-	-	X	X	X	1
17. Republic Steel Corp. Rolling Mills	Rolling Mills	X	4.82	Mosquito Cr.	1.79	3.02	Cooling - None Ind. - Lime Neut.	Mahoning R.	-	-	-	?	X	X	-	-	X	X	X	1
18. Valley Fabricators, Inc.	Steel Stampings	X	0.025	Niles	0.025		None	X	-	-	-	X	X	X	-	-	X	X	-	1
McDonald, Ohio																				
19. U. S. Steel Corp. McDonald Mills	Blast Furnace Steel Works & Rolling Mills	X	56.5	Mahoning R. & Municipal	7.0	48.0	Cooling - None Ind. - Scale Pits, Lagoon	Mahoning R.	X	-	X	X	X	X	-	-	X	X	X	1, 2

Table 3 (Cont.)

Data on Sources of Industrial Pollution
Mahoning River & Tributaries

Name & Location	Process	Production	Water Use, mgd	Source of Water	Waste Volume, mgd Cooling	Waste Volume, mgd Industrial	Treatment	Discharge to	CN #/day	Cr^{+6} #/day	F #/day	Temp. °F	Oil gal/day	Acid #/day	NH_3 #/day	Phenol #/day	Fe #/day	Susp. Sol. #/day	BOD #/day	Source of Data
Youngstown, Ohio																				
20. Allied Chemical Corp.	Coal Tar Oil Fractions & Pitch	X	X	X	-	0.025	Oil Separator	Mahoning R.	-	-	-	X	X	X	-	X	-	X	X	1
21. Fitzsimons Steel Co., Inc.	Cold Rolled Sheet, Strip & Bars	X	0.042	Ohio Water Service & Well	0.019	0.019	Cooling - None Ind. - Contr. Disch.	Dry Run	-	-	-	X	X	X	-	-	X	X	-	1, 2
22. Hoover Products, Inc.	Games & Toys	X	0.12	City	0.16	-	None	Storm Sewer	-	-	-	X	-	-	-	-	-	-	-	1
23. Kessler Products Co., Inc.	Misc. Plastic Prod.	X	0.13	City	0.13	-	None	Storm Sewer	-	-	-	X	-	-	-	-	-	-	-	1
24. Koppers Co., Inc. Tar Products Div.	Asphalt Felts & Coatings	X	X	X	-	0.14	Oil Separator	Crab Cr. to Mahoning R.	-	-	-	X	X	-	-	X	-	X	X	Visit
25. MacKenzie Muffler Co.	Auto Parts & Accessories	X	0.21	City	0.16	-	None	Storm Sewer	-	-	-	X	-	-	-	-	-	-	-	1
26. Republic Steel Corp.	Blast Furnaces, Coke Ovens, Steel Works & Rolling Mills	X	234.4	Mahoning R. O.W.S. & City	185.6	49.9	Cooling - None Ind. - Settling Pits	Mahoning R.	X	-	X	X	X	X	X	X	X	X	X	1, 2
27. U. " Steel Corp. Ohio Steel Works	Blast Furnaces, Steel Works & Rolling Mills	X	124.5	Mahoning R. O.W.S. & City	100.0	24.0	Cooling - None Ind. - Clarifying Pumps, Scale Pits	Mahoning R.	X	-	X	X	X	X	X	X	X	X	X	1, 2
28. Wilkoff Co.	Fab. Metal Products	X	0.019	City & O.W.S.	0.011	0.008	None	Dry Run	-	-	-	X	X	X	-	-	X	X	-	1, 2
29. Youngstown Sheet & Tube Co. Brier Hill Works	Blast Furnaces, Coke Ovens, Steel Works & Rolling Mills	X	64.3	O.W.S. Girard, Yo., Pumping	55.5		None	Mahoning R.	X	-	X	X	X	X	X	X	X	X	X	1, 2
Campbell, Ohio																				
30. Youngstown Sheet & Tube Co.	Blast Furnaces, Coke Ovens, Steel Works & Rolling Mills	X	165.37	O.W.S.	X	X	Settling - Gas Wash Water, Coke Quenching, Acid Sludge Recovery	Mahoning R.	X	-	X	X	X	X	X	X	X	X	X	2
Struthers, Ohio																				
31. Youngstown Sheet & Tube Co.	Steel Conduit, Wire, etc.	X	16.3	Mahoning R.	X	X	X	Mahoning R.	X	X	X	X	X	X	-	-	X	X	X	2
Edinburg, Pa.																				
32. American Cyanamid Co.	Nitroglycerin	X	X	Mahoning R.	-	0.002	Neut. of Acid Wash Water	Mahoning R.	-	-	-	-	-	X	-	-	-	X	X	3

Sources of Data:
1. 1960 Industrial Questionnaire. State of Ohio, Department of Natural Resources, Division of Water.
2. Ohio Department of Health. 1952-54 Mahoning-Shenango River Survey Data.
3. Pennsylvania Department of Health, Reg. 3 Office Records.

Notes:
"O.W.S." - Ohio Water Service. A private company supplying water to consumers in the Youngstown-Campbell-Struthers area.
"X" - Constituent likely to occur in waste discharges. No data available.
"-" - Constituent not likely to be present in waste discharges.

In addition to the steel mills listed above, there are three other large industrial water users. These are:

Community	Name
Warren, Ohio	Copperweld Steel Co.
Niles, Ohio	Republic Steel Corp.
Struthers, Ohio	Youngstown Sheet & Tube Co.

There are a number of satellite industries in the Mahoning River basin that fabricate steel products. Other types of manufacturing include coal tar products, titanium and zirconium products, rubber goods, and glass lamps.

Based on available information, the total water used by industries discharging wastes directly to the Mahoning River and its tributaries amounts to 820 mgd. It is significant that the nine industrial plants listed above account for 99 percent of this total water use. Review of effluent data for manufacturing plants, other than steel, reveal them to be relative minor sources of industrial wastes. Industrial pollution evidenced by Mahoning River data originates primarily at the steel manufacturing and fabricating plants.

Now as to acid wastes, the removal of oxide scale from steel prior to further processing is an essential step in the manufacture of many steel products. Such major items as sheets, strip, wire and pipe are descaled by immersion in an acid bath for a short period. This operation is called pickling. Dissolution of part of the scale and some of the base metal results in depletion of the acid and accumulation of iron scale in the bath; for this reason the solution eventually loses its effectiveness and must be discarded.

Spent pickling solutions and acid rinse waters continue to be major sources of acid discharged to the Mahoning River. Sulfuric acid is generally used for steel pickling, accordingly these discharges are high in dissolved iron salt and sulfates. It has been reported that some of the steel mills treat spent pickle liquor with lime to neutralize free acid. Other mills discharge spent pickle liquor onto slag dumps. Drainage from these neutralizing processes would be expected to be high in magnesium sulfate and calcium sulfate. These sulfate salts contribute undesirable permanent hardness to the Mahoning River waters. Rinse water following pickling operations are a continuing source of acid. The oxygen demand of ferrous sulfate discharged to the Mahoning River may be a significant factor in reducing oxygen levels in this stream.

Hydrofluoric acid and nitric acid are employed by two manufacturing plants in the Niles, Ohio, area. These are recognized as minor sources of acid. These acid wastes are neutralized at one of the plants and a pilot plant for acid recovery is presently being installed at the other plant.

Now as to iron wastes, acid wastes from cleaning steel are a major source of iron in solution. Inert iron particles originate in rolling mill scale and in blast furnace flue gas wash water. It is customary to provide sedimentation facilities for recovery of mill scale and iron ore from the blast furnace flue gas wash water. However, significant quantities of these suspended solids still reach the Mahoning River.

As to oil wastes. Type of bearings and their lubrication in rolling mills are important to water pollution because of oil which may appear in the mill discharge. Information is lacking on the quantities of oil originating at these sources. However, oil slicks on the Mahoning River downstream from some of these rolling mills is evidence of this oil waste.

Phenol Wastes.

Phenol originates from the by-product coke plants and the coal tar processing plants which operate in the Warren-Youngstown area. It is understood that concentrated wastes at the by-product plants are used to quench coke. Phenol adsorbed on the coke carries over and appears in the blast furnace flue gas wash water.

And that's one of the principal sources of phenol that we still observe in the Mahoning River. It is a closed system but it still bursts out when you use the metallurgical coke in the blast furnace. The Mahoning River data reveal considerably more phenol than can be accounted for from the effluent of the plants processing coal tar. This means that the steel mills continue to discharge significant quantities of phenol.

Cyanide Wastes. By-product coke plants are recognized as a potential source of cyanide wastes. The highest concentration of cyanogen compounds occurs in the gas final cooler water. It is understood that the by-product coke plants operate essentially closed systems. This would mean that cyanide wastes would be released to the Mahoning River only at times when the water system was out of balance resulting in overflow.

Blast furnace flue gas wash water is another source of cyanide. The cyanide concentrations in these waters are low but the volume is considerable.

There is some metal finishing in the Warren-Youngstown area. Rinse waters from these metal plating departments constitute another source of cyanide wastes.

Heavy Metal Wastes. Metal finishing operations referred to in the Warren-Youngstown area are also a source of heavy metals. One of the plants in the Niles area was reported to discharge some quantities of hexavalent chromium. Such materials are highly pollutional in character.

Shenango and Beaver Rivers.

The principal industrial activity in the valleys of Beaver River and Shenango River is the production of iron and the fabrication of steel products. There is some electro-plating and sand and gravel washing. The principal industries discharging wastes to the Shenango-Beaver Rivers are listed in Table 4.

Acid and Iron Wastes.

Quantities of acid and iron in steel pickling rinse waters are discharged to the Shenango River below the dam of the Shenango Valley Water Company at Sharon, Pennsylvania. Major sources are Sharon Steel Company, Republic Steel Company, and Babcock and Wilcox Tube Company. Waste pickle liquor is collected and treated off site except at Sharon Steel where it is discharged to hot slat piles. The oxygen demand of ferrous sulfate discharged to the Shenango River is recognized.

One small plant at Greenville, Pennsylvania, neutralizes hydrofluoric acid wastes prior to discharge to the Shenango River.

Table 4

Data on Sources of Industrial Pollution
Shenango and Beaver Rivers

Name & Location	Process	Production	Water Use, mgd	Source of Water	Waste Volume, mgd Cooling	Waste Volume, mgd Industrial	Treatment	Discharge to	CN #/day	Cr^{+6} #/day	F #/day	Temp. °F	Oil gal/day	Acid #/day	NH$_3$ #/day	Phenol #/day	Fe #/day	Susp. Sol. #/day	BOD #/day	Source of Data
Hubbard, Ohio																				
1. General A.M. Transport. Corp.	Heavy Metal Fabr.	X	X		0.26		Oil Separation of Wash Water	Yankee Cr.				X	X							1,2
2. Valley Mould & Iron Co.	Cast Molten Iron	X	X		0.1		Cooling Water, n.t.	Yankee Cr.				X								1,2
3. ~~[illegible]~~ Co.	~~[illegible]~~	X	~~[illegible]~~		~~[illegible]~~	~~[illegible]~~	~~[illegible]~~ Water, n.t. Gas Scrubber Overflow	Yankee Cr.				X						X		~~[illegible]~~
Jamestown, Pennsylvania																				
4. Blasco, Inc.	Electroplating Parts for Gym Sets	X	X		-		Acid & Alk. Rinses Combined & Discharged Through Lagoon. Zinc Cyanide Wastes are Chlorinated & Precipitated. Chromate Wastes are Reduced & Precipitated.	Shenango R.												3
Hadley, Pennsylvania																				
5. Atlas Sand & Gravel	Sand & Gravel Washing	X	X		0.28		Sedimentation	Little Shenango R.												3
Greenville, Pennsylvania																				
6. Damascus Tube	Stainless Steel Tubing	X	X		0.02		HNO$_3$ & HF Wastes Treated with Lime	Shenango R.						X			X			3
7. Westinghouse Electric Corp.	Etching Transformer Parts	X	X		0.001		Neutralize Acid Wastes	Shenango R.												3
Sharpsville, Pennsylvania																				
8. Shenango, Inc.	Blast Furnace	600 T/day	X		29.0		Gas Scrubber Water Treated by Sedimentation. Inviolation for Discharge of CN.	Shenango R.	4 mg/l±				X					X		3
Sharon, Pennsylvania																				
9. National Castings Co.	Steel Foundry	X	X		0.216	X	Sedimentation of Sand Reclamation Waste Water. Furnace Cooling Water does not Require Treatment.	Shenango R.				X				1.5 mg/l		200 mg/l±		3
10. Sharon Steel Co.	Blast Furnaces & Steel Mill	70,000 T/mo.			14.0 30.0		Acid Rinses not Treated Steelworks not Treated	Shenango R.				X	X	X			X	X		3
11. Sharon Tube Co.	Butt Welded Pipe	X	X		- 0.43		Acid Rinses not treated Cooling Water from Scale Pits not treated	Shenango R.					X	X			X	X		3
12. Westinghouse Electric Corp.	Electroplating of Transformer Parts	X	X		0.12		Neutralize Acid & Caustic Wastes. Complete Chlorination of Cyanide Wastes.	Shenango R.												3
12a. Sawhill Tubular Prod.(Mercer Pipe Div)	Steel Tubing	9,000 T/mo.	X		-		Secondary Acid Rinses, n.t. Cooling Water, n.t.	Shenango R.					X	X			X			3
Mercer, Pennsylvania																				
13. Westrac Co.	Tractor Parts	X	X		0.10		Oil Separation of Oil-bearing Waste Water	Otter Cr.					X							3
New Wilmington, Pennsylvania																				
14. New Wilmington Cheese Co.	Receiving Milk	X	X		Small		Trickling Filter	Little Neshannock												3

Table 4 (Cont.)

Data on Sources of Industrial Pollution
Shenango & Beaver Rivers

Name & Location	Process	Production	Water Use, mgd	Source of Water	Waste Volume, mgd Cooling	Waste Volume, mgd Industrial	Treatment	Discharge to	CN #/day	Cr+6 #/day	F #/day	Temp. °F	Oil gal/day	Acid #/day	NH3 #/day	Phenol #/day	Fe #/day	Susp. Sol. #/day	BOD #/day	Source of Data
New Castle, Pennsylvania																				
14. Blair Strip Steel	Steel Rolling Mill	X	X			0.288	Oil Separators on Cooling Water. Acid Wastes Hauled Off Site.	Big Run												3
15. Crane Co.	Cast Iron Foundry	X	X			0.288	None. In violation	Big Run					X					X		3
16. Flowline Co.	Welded Fittings	X	X			0.005	Acid Rinses Not Treated	Big Run						X			X			3
17. Shenango Ceramics	Dinnerware	X	X			0.14	None. In violation	Shenango R.										X		3
18. Universal Rundle	Vitrified Sanitary Ware	X	X			0.216	Sedimentation & Chlorination	Shenango R.												3
West Mayfield, Pennsylvania																				
19. Babcock & Wilcox Tube Co.	Tubular Steel Prod.	11,000 T/mo.	X			1-2 5-10	Cooling Water Passed Through Oil Separators Acid Rinses Not Treated	Beaver R.						X			X			3
Beaver Falls, Pennsylvania																				
20. Republic Steel Company	Drawing Steel Bars	7,000 T/mo.	X			0.089	Acid Rinses Not Treated	Beaver R.						X			X			3

Sources of Data:
1. 1960 Industrial Questionnaire. State of Ohio, Department of Natural Resources, Division of Water.
2. Ohio Department of Health. 1952-54 Mahoning-Shenango River Survey Data.
3. Pennsylvania Department of Health, Reg. 3 Office Records.

Notes:
"X" - Constituent likely to occur in waste discharges. No data available.
"-" - Constituent not likely to be present in waste discharges.

Cyanides Wastes.

There is one recognized source of untreated cyanide-bearing waste water discharged to the Shenango; this is waste water from the blast furnaces at Sharpsville.

Oil Wastes.

The cooling water used in rolling mill operations may pick up some oil from oil-lubricated bearings. These cooling waters are discharged to the Shenango River below the dam at Sharon without benefit of oil separation.

Suspended Solids.

The cooling waters from rolling mill operations is passed through scale pits for recovery of mill scale but fine material is not completely removed. Additional discharges of suspended solids occur from foundry and ceramic operations.

Ceramic Operations.

No mention is made at this point of thermal pollution; that was covered yesterday by one of the industrial reports. I believe it is mentioned further along in this report. Certainly we are all aware of the fact that the industries have been plagued for several decades on hot water although we don't need to go further into that.

Mr. Chairman, this concludes my portion of the report.

MR. WEAKLEY: I was just curious about

the wide variance in those two figures that you called attention to. Could you explain that, please? The 800 some odd million gallons per day that you referred to as compared with the 1500 million gallons per day of water used that was referred to by the speakers that preceded you.

MR. BLACK: May I refer that question to Mr. Kittrell, please?

MR. KITTRELL: The first figure, that of 15,500 million gallons per day is for peak production by all plants. The other value of something like 800 or a little more than 800 is an average water use.

MR. WEAKLEY: On page 12, your figure referred to as average industrial use. The first figure is described as an average figure, also, isn't it?

MR. KITTRELL: That is peak production, at time of peak production.

MR. WEAKLEY: I see the distinction that you make but I am still confused.

CHAIRMAN STEIN: Would you try your hand at that again, Mr. Kittrell? Take both figures and let's see if we can get an explanation. I am not sure I understand.

MR. KITTRELL: On page 12: "Average industrial use of Mahoning River water by the principal firms has been reported to be in excess of 1,500 million gallons per day during peak production periods."

This means when all plants are operating at full capacity. The other value on page 16 deals with the average use of water during periods when -- this is the over-all average use of water including those periods when production is not at its peak. I think it was unfortunate that the word "average" was used at the beginning of the sentence on page 12. This refers to a daily average but it is somewhat confusing when it says "average water use." It actually should be average daily water use during peak production.

And the other figure might be referred to, the one on page 16, as average annual use.

CHAIRMAN STEIN: Is that satisfactory, sir?

MR. WEAKLEY: I understand what he said.

CHAIRMAN STEIN: Are there any comments or questions? Mr. Boardman.

MR. BOARDMAN: Again, the information on the Shenango and Beaver we don't feel is appropriate to discussing the Mahoning pollution. The specific information in the report seems to deal with the Shenango and the general information on the Mahoning.

CHAIRMAN STEIN: I don't know if I understood that. Do you want to answer that?

MR. KITTRELL: That would appear to be a personal observation.

MR. CLEARY: Mr. Black, I have a couple of questions. On page 18, you commented about the phenol and, if I understood in what you said, your remarks as interpreted, that the phenol that was adsorbed by the coke, when this was put into the blast furnaces, this residual or what was left over would ultimately find its way in the stream. Is that a fair interpretation?

MR. BLACK: This interpretation is correct. This phenol shows up in the flue gas wash water and amounts to 20 or 30 pounds of phenol for each thousand tons of pig iron, so you can multiply that by the tons of pig iron produced in this area and you have got a number.

MR. CLEARY: The reason I asked the question is because I thought the intense heat in the blast furnace, I thought this phenol would be burnt out.

MR. BLACK: That is documented in the literature. I can give you the records if you would like.

MR. CLEARY: No, that's not necessary. On page 19, there is some comment about cyanide, and the statement that the cyanide concentrations in the waters are low but the volume is considerable.

Now, from -- and I presume what we are working up to is a health hazard indication and from that standpoint, what are we most interested in, the concentration in the stream or the volume that is produced? In other words, the implication there may be that this is a health hazard because you say the volume is considerable although the concentration is low. It is really the concentration we are interested in, isn't it?

MR. BLACK: Permit me to respond to your comment in this way: We are endeavoring in this report to explain some of the observations in the Mahoning River and we found some cyanide and here we have a source of cyanide, although the concentration is low enough to be of limited concern, yet here it is and when you multiply it out in pounds, you see, here is a source and I thought we ought to include that in all fairness to the plating departments, the electro-plating.

MR. CLEARY: I think you made it quite clear. It is of limited concern, that's the point.

Now, I have one other question.

MR. BLACK: It's of concern.

MR. CLEARY: All right. The other question is will these changes that have been made here result in any changes in your general conclusions, do you think?

MR. BLACK: Not at all.

MR. CLEARY: Thank you.

CHAIRMAN STEIN: Are there any comments or questions? Mr. Black, I have one question that I believe at least would help me.

I watched with interest the presentation of Mr. Doolittle on the works that the steel industry in particular were putting in to deal with their pollution problems and their waste disposal problem. I wonder if you would, with your experience in industrial waste, relate this to the effect on the river.

Now, what is your opinion? Is the river in good shape or will it be in good shape when this program is completed?

MR. BLACK: Industry has spent tremendous sums of money in this area; we all know that, Mr. Doolittle confirmed it. We still have to look at the stream and, frankly, it has been a bit difficult to explain the condition of the Mahoning River. It would seem that we would have to take a very hard look at the residual wastes coming from the industries in this area.

CHAIRMAN STEIN: Do you think these residual wastes are still significant?

MR. BLACK: Considering all water

uses, we would have to answer in the affirmative. People are drinking this water and you have -- you will soon have phenol results at the state line and at Beaver Falls.

CHAIRMAN STEIN: Thank you.

MR. DOOLITTLE: Mr. Chairman, could I make just one observation? I will stick my neck out only slightly, I hope, but I would like it to appear in the record that during the course of one of the studies we made, which I referred to yesterday, some time during the years 1953 to '56 when we were trying so very much to determine more about the relationship between phenolic discharges and taste and odor at Beaver Falls. With the cooperation of the Beaver Falls works and with the knowledge of the State of Ohio and under very close monitoring at one point, in order to run a test which we thought would really be conclusive, we discharged the full untreated steel wastes at our coke plant running concentrations up to 14,000 ppm in the wintertime when you would expect the least possible die-away because of the cold temperatures.

We measured passage of time, as I told you, and had very careful controls to determine when those discharges reached Beaver Falls. And by the time this tremendous concentration, 14,000 parts per million, reached Beaver Falls, somewhere above Beaver Falls it had been dissipated to a biological oxidation or dilution or whatever means to as

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low as 18 parts per million.

CHAIRMAN STEIN: Mr. Black, do you care to respond or not?

MR. BLACK: No.

CHAIRMAN STEIN: Are there any further comments or questions?

MR. POSTON: If there are no further comments, we will proceed and Mr. Kittrell again will tell us about the effects on water quality and water uses.

MR. KITTRELL: The effects of pollution on water quality and water uses.

Bacteria. The density of coliform bacteria is used in evaluating bacterial pollution of streams and as a basis for water quality objectives for various water uses. The results of coliform bacteria determinations are expressed in terms of most probable number, or MPN, per 100 milliliters (ml) of water. One hundred ml is a little less than one-half cup. The coliform group usually is designated as total coliform.

A commonly used water quality objective limits average coliform densities to a maximum of 5,000 MPN/100 ml in raw water that is used for municipal water supply. The same limit is used for water sports that do not involve body contact. Where there is swimming or other water contact activities, it is common practice to set the upper limit on average coliforms in raw water at 1,000 MPN/100 ml. Where there is suitable water, some of the people who live near the strea, and others who visit the river to enjoy being near water, will swim on an unorganized basis. Probably few venture into the highly polluted Mahoning River, but boating and water contact activity, in the form of water skiing, are known to take place along the lower Beaver River in the vicinity of Beaver Falls, Pennsylvania.

The Pennsylvania State Health Department conducted a water quality study of the lower Mahoning, Shenango, and Beaver Rivers from 1959 to 1961. The locations of the sampling stations are shown in Figure IV. Samples were collected on a monthly basis for the two-year period, beginning and ending in the month of September. Table 6 is a summary of the findings. At Station 2, a few miles below the state line in the Mahoning River, the Pennsylvania data indicate that the annual average density of coliform bacteria in the stream was 566,000 MPN/100 ml. At Station 8 about four miles downstream from the Beaver Falls municipal water intake on the Beaver River, the average coliform density during the two-year study period was reported as 143,900 MPN/100 ml. This value, based on a limited number of samples, probably is not so representative of average conditions as are the water plant daily operating records. The bacterial data of the 1964 operating records of the Beaver Falls Municipal Authority, Eastvale Waterworks, included in Table 7, reveal a maximum monthly average of 170,000 MPN/100 ml, and an annual mean of 31,300 MPN/100 ml, or more than six times the previously cited water supply source objective. Such high bacterial densities indicate the existence of a hazard to health to all who come in contact with the water, including water supply consumers in the event of a failure in waterworks equipment or operation.

Dissolved Oxygen.

Organic materials in the processes of decomposition in a stream reduce the dissolved oxygen. In addition added heat reduces the capacity of the stream to retain oxygen. The ability of the stream to assimilate waste loads discharged to it without excessive reduction of dissolved oxygen is an important factor in the ability of the stream to sustain a desirable aquatic life, including fish. Optimum warm water fish production in streams generally requires dissolved oxygen levels of about 5 mg/l. Lower levels of D. O. may support a less desirable fishery and when D. O. levels drop below 3 mg/l, especially in the presence of other contaminants, it is probable that few if any fish can long survive. The State of Ohio and Pennsylvania have established objectives for the minimum dissolved oxygen concentrations which may be allowed in

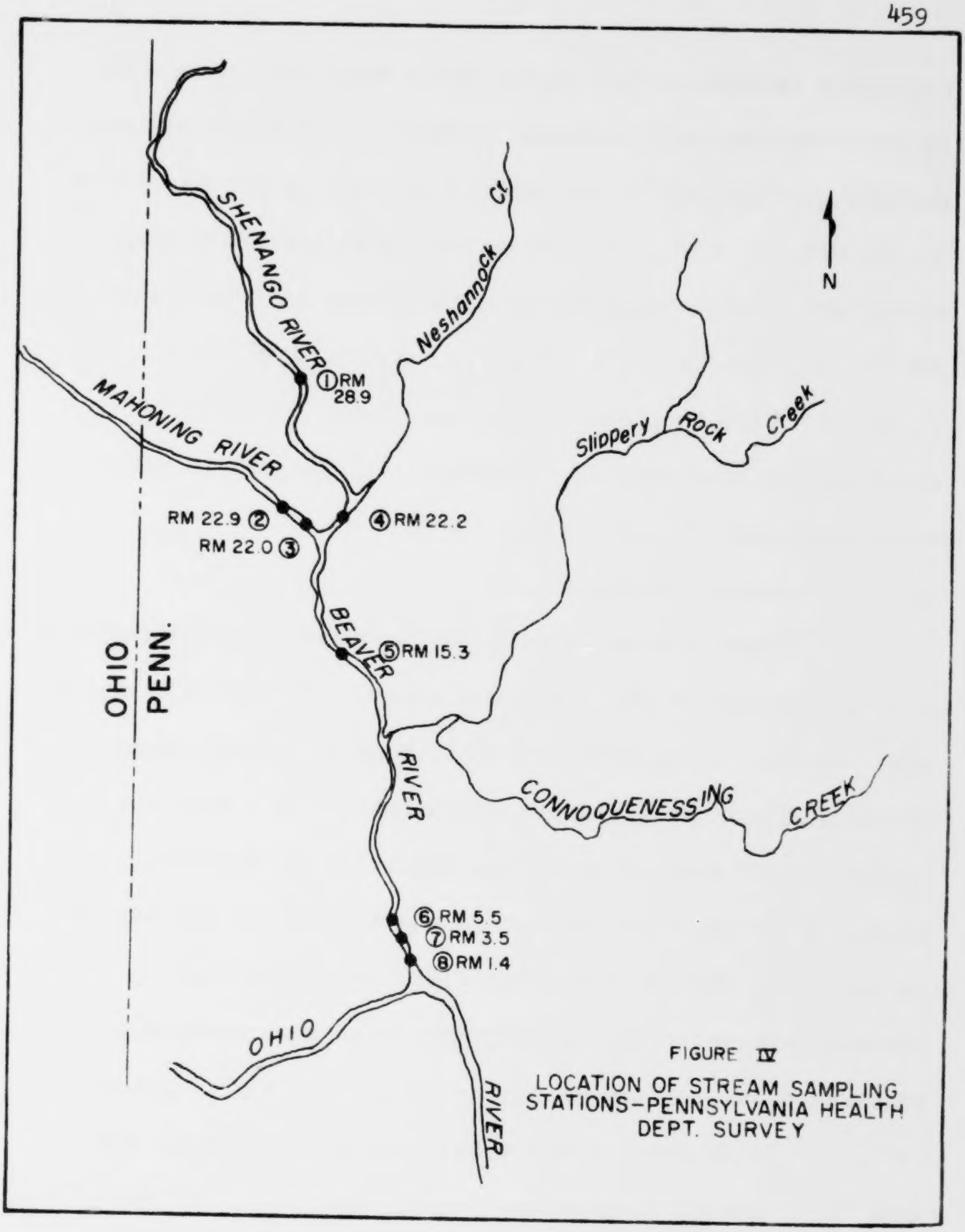
N
SHENANGO RIVER
Neshannock Cr.
① RM 28.9
MAHONING RIVER
RM 22.9 ②
RM 22.0 ③
④ RM 22.2
Slippery Rock Creek
OHIO
PENN.
BEAVER
⑤ RM 15.3
RIVER
CONNOQUENESSING CREEK
⑥ RM 5.5
⑦ RM 3.5
⑧ RM 1.4
OHIO
RIVER

FIGURE IV

LOCATION OF STREAM SAMPLING STATIONS–PENNSYLVANIA HEALTH DEPT. SURVEY

Table 6

Surface Water Quality
Beaver-Mahoning and Shenango Rivers in Pennsylvania
September 1959-September 1961

Station[a]	D.O., mg/1			Coliform, MPN/100 ml		Phenol, μg/1			Alkalinity, mg/1			Total Iron, mg/1		
	Avg.	Max.	Min.	Max	Min.	Avg.	Max.	Min.	Avg.	Max.	Min.	Avg.	Max.	Min.
1	6.6	11.0	4.4			15	100	0	70	120	32	1.6	3.4	0.2
2	4.9	13.8	1.8	11,000,000	230	29	100	0	72	110	44	3.5	16.0	0.2
3	4.8	13.2	1.3	4,600,000	9,300	38	150	0	72	115	44	3.0	20.0	0.3
4	8.3	15.8	4.6			20	100	0	71	125	32	1.2	2.8	0.5
5	5.7	13.3	2.0			20	150	0	69	115	44	1.8	8.4	0.2
6	7.3	13.6	4.1			06	100	0	70	126	32	1.0	3.4	0.2
7	7.8	10.6	4.1			35	300	0	65	110	34	1.5	8.0	0.3
8	8.5	10.9	5.0	1,100,000	230	28	300	0	65	110	32	1.4	5.0	0.2

[a] See Figure IV for location of sampling stations.

Table 7

Water Quality Data
Beaver River
Eastvale Waterworks - Pennsylvania
1964

		Temp. (°F)	Alk. (mg/l)	Turb.	Color	pH	Hard. (mg/l)	Iron (mg/l)	Mang. (mg/l)	Bacteria (MPN/100 ml)	Odor
Jan.	Avg.	37	51	35	15	7.1	200	0.28	0.47	13,900	-
	Max.	43	77	250	32	7.3	246	1.25	1.00	40,000	85
	Min.	34	27	8	7	6.9	130	0.08	0.23	5,400	20
Feb.	Avg.	39	46	19	20	7.0	198	0.24	0.36	11,200	-
	Max.	40	69	40	30	7.3	234	0.52	0.50	34,000	50
	Min.	35	36	11	14	6.9	156	0.11	0.25	3,100	25
March	Avg.	42	37	191	25	7.2	133	2.57	0.50	34,800	-
	Max.	47	68	2000	45	7.3	146	50.00	1.35	105,000	250
	Min.	39	20	12	16	6.9	88	0.12	0.25	7,300	30
April	Avg.	52	36	56	28	7.2	131	0.82	0.38	39,600	-
	Max.	60	46	210	55	7.8	164	2.00	0.80	85,000	200
	Min.	42	27	12	10	7.0	114	0.15	0.25	9,600	30
May	Avg.	67	44	23	28	7.2	153	0.87	0.29	33,500	-
	Max.	74	54	95	45	7.5	202	2.75	0.70	140,000	90
	Min.	60	35	10	15	7.0	120	0.18	0.10	2,000	30
June	Avg.	75	50	22	18	7.2	194	0.82	0.37	26,100	-
	Max.	80	58	90	43	7.5	204	1.12	0.60	65,000	60
	Min.	67	43	8	8	7.1	178	0.32	0.25	6,000	30
July	Avg.	82	46	20	19	7.2	188	0.78	0.45	32,600	-
	Max.	87	66	29	26	7.4	206	1.18	0.90	100,000	60
	Min.	74	32	10	9	7.0	162	0.45	0.20	8,000	30
Aug.	Avg.	78	44	19	16	7.1	188	0.74	0.36	43,000	-
	Max.	82	58	32	31	7.5	202	0.93	0.75	77,000	60
	Min.	73	30	10	8	6.9	180	0.52	0.20	11,000	30
Sept.	Avg.	76	37	16	10	7.0	208	0.71	0.33	31,600	-
	Max.	83	45	23	20	7.3	222	1.25	0.45	55,000	60
	Min.	69	24	10	6	6.7	196	0.18	0.18	10,000	30
Oct.	Avg.	63	36	10	9	6.8	221	0.78	0.39	24,800	-
	Max.	70	51	18	21	6.9	248	1.68	0.52	64,000	50
	Min.	60	23	7	7	6.5	210	0.38	0.30	9,000	25
Nov.	Avg.	58	42	11	10	6.8	212	0.69	0.36	15,000	-
	Max.	63	51	22	18	6.9	230	1.00	0.50	46,000	60
	Min.	45	32	7	7	6.7	188	0.40	0.25	8,000	25
Dec.	Avg.	42	39	28	18	6.9	166	1.18	0.46	70,200	-
	Max.	47	47	155	32	7.2	208	5.00	0.85	170,000	70
	Min.	39	30	10	9	6.8	138	0.28	0.25	8,000	30
Annual Average								0.87	0.39		

their respective streams. Ohio has established 4 mg/l as the minimum acceptable concentration of D. O. in the Mahoning River above Warren, Ohio. Pennsylvania has selected the same objective for the lower Mahoning, Shenango, and Beaver Rivers. Because heat and other pollutants presently discharged to the reach from Warren to Lowellville, Ohio, prevent the maintenance of desirable aquatic life in the stream, Ohio permits a minimum of 3 mg/l from Warren to the Pennsylvania state line. This lower concentration is expected to prevent excessive odor nuisance conditions, even though it may not maintain optimum fish productivity.

The Aquatic Life Advisory Committee of the Ohio River Valley Water Sanitation Commission has recommended that "dissolved oxygen content of warm water fish habitats shall not be less than 5ppm during at least 16 hours of any 24-hour period. It may be less than 5 ppm for a period not to exceed eight hours within any 24-hour period, but at no time shall the oxygen be less than 3 ppm. To sustain a coarse fish population, the dissolved oxygen concentration may be less than 5 ppm for a period of not more than eight hours out of any 24-hour period, but at no time shall the concentration be below 2 ppm."

Available stream data from an Ohio report indicate that D. O. levels in the Mahoning River immediately below Warren, Ohio, drop as low as 3.2 mg/l and continue to deplete as the water progresses downstream about 25 miles to Lowellville. At Lowellville, about a mile upstream fromthe state line, a continuous monitoring station is operated by the U. S. Geological Survey in cooperation with the Ohio Department of Health. For the calendar year of 1964 there were 162 days in which the D. O. dropped below 1 mg/1, and 219 days when the D. O. was less than 2 mg/1. For 63 days the record shows zero D. O., and here the stream is biologically dead, except for the most pollution-tolerant organisms.

No recent D. O. data were available immediately downstream from the state line, but from the previously mentioned 1959-61 Pennsylvania study, D. O. as low as 1.3 mg/1 was reported in this vicinity. Above the point of discharge of sewage from New Castle, Pennsylvania, about 10 miles downstream, the minimum dissolved oxygen was 1.3 milligrams per liter, also.

CHAIRMAN STEIN: Mr. Kittrell, I wonder if we can stop there. We have a consensus among the Board, at least the conferees, and they, I suspect, would like to eat at regular times. And this may be shared with the rest of the room.

I was checking the length of this. I wonder if we can split now and we can get back here at half past 2:00 and resume again.

We will stand recessed until half past 2:00.

MR. KITTRELL: I had hoped to insert some of the data from Ohio at this point before completing this section. Can we do that before we adjourn? This will only take a few seconds.

CHAIRMAN STEIN: All right.

MR. KITTRELL: A record of water quality observation made by the Ohio Health Department during 1964, the most recent data that we have showed that dissolved oxygen at Lowellville was below their stated objective of three milligrams per liter, 18.9 percent of the time, and the dissolved oxygen was below the Pennsylvania objective just below the state line of 4 milligrams per liter, 47.2 percent of the time.

CHAIRMAN STEIN: Thank you. Mr. Kittrell.

(Whereupon,a luncheon recess was had to reconvene at 2:30 p.m.)

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AFTERNOON SESSION

2:40 p.m.

CHAIRMAN STEIN: May we reconvene. Mr. Poston.

MR. POSTON: Mr. Kittrell will continue.

MR. KITTRELL: I would like to start in making a slight change in the final statement I made just before I completed the reading of the section on dissolved oxygen.

I quoted certain percentages of the time where dissolved oxygen was less than certain values. I would like to change that to certain percentages of the observations were below these percentages. There were about 52 or -3 observations, approximately once a week, for the year of 1964 by the Ohio Department of Health and therefore it does not cover the entire time.

CHAIRMAN STEIN: Would you repeat that again, Mr. Kittrell?

MR. KITTRELL: I say I would like to change the last statement I made about the new data that we obtained from Ohio. I said that the dissolved oxygen had been below certain values, certain percentages of the time. Actually, I would prefer to say that certain percentages of the observations were below certain values.

CHAIRMAN STEIN: Would you continue.

MR. KITTRELL: Heat. Several public and private concerns have observed water temperatures in the Mahoning River in the Youngstown area for many years. River temperatures are related to air temperatures, streamflow, and the heat added through industrial cooling operations. Heated discharges to the Mahoning River are a form of pollution, since high river temperatures adversely affect aquatic life, the use of the river for industrial cooling purposes, production costs, and the stream's ability to assimilate organic wastes. The waste assimilative capacity is affected by reducing the dissolved oxygen available at saturation, and increasing the rate at which biochemical oxidation of organic wastes with accompanying D. O. depletion, takes place.

Following extensive study, the Aquatic Life Advisory Committe of the Ohio River Valley Water Sanitation Commission has recommended that "... in order to maintain stream conditions capable of producing an annual harvestable fish crop comparable to that produced in natural waters of the particular area under consideration, waste discharges be so controlled that the temperature of the receiving water:

(1) Shall not be raised above 34 degrees C. (93 degrees F.) at any place or at any time;

(2) Shall not be raised above 23 degrees C. (73 degrees F.) at any place or at any time during the months of December through April;

(3) Shall not be raised in streams suitable for trout propagation."

Temperature influences physiologically all the vital processes of fish, including activity, feeding, growth, and reproduction. Higher temperatures often favor the coarse and less desirable fish species. While high temperatures may not prove immediately lethal, they may impair metabolic activity of the fish to such an extent that any additional stress, such as pollution, may increase the adverse effects of temperature, and result in a high level of mortality.

A shift in algal populations has been correlated with the introductions of heated waters; as the temperature increases, the diatoms normally associated with unpolluted streams decrease, with a resultant rise in green algae and finally blue-green algae. These may increase the problem of tastes and odors in water supplies. It has also been found that there is tolerance limit close to 90 degrees F. for a "normal" population structure of bottom dwelling fish food organisms accompanying further temperature rise.

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Flow regulation resulting from the operation of Berlin and Mosquito Creek Reservoirs has accomplished some reduction in river temperatures. However, the temperatures are still extremely high. West Branch Reservoir when in operation is expected to further reduce the river temperatures in the industrial area along the Mahoning River. It is estimated that this reservoir will effectively reduce the average annual water temperature in the stream at Youngstown by about 4 degrees F.

As shown in Table 8 maximum river temperatures at Lowellville exceeded 93 degrees F. during seven months in 1964, in May through November. The average temperature was 94 degrees F. over the four-month period between June and September. Temperatures in excess of 100 degrees F. occurred in June, July, and September. They exceeded 73 degrees F. in April and December. Even after the West Branch Reservoir goes into operation, the river temperatures will not be reduced below levels harmful to fish and other aquatic life.

(See next page.)

Table 8

Mahoning River Temperatures (F.°)

Lowellville, Ohio

		1964		1963		1962		1961		1960		1959	
		Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.
Jan.	Avg.	59	55	58	55	53	51	63	61	-	-	45	42
	Max.	66	63	65	61	59	56	67	66	-	-	62	58
	Min.	45	41	50	50	45	43	57	57	-	-	37	36
Feb.	Avg.	64	61	58	55	53	51	60	58	-	-	42	40
	Max.	69	65	62	60	58	54	67	65	-	-	49	48
	Min.	58	55	49	48	42	40	47	46	-	-	36	35
March	Avg.	51	49	47	45	49	47	50	49	-	-	52	49
	Max.	66	63	61	56	60	60	56	55	-	-	61	61
	Min.	40	39	38	38	41	40	47	47	-	-	42	42
April	Avg.	62	58	70	66	64	61	53	51	-	-	72	69
	Max.	78	72	80	76	82	79	60	59	-	-	84	84
	Min.	45	44	60	56	53	52	47	47	-	-	54	53
May	Avg.	82	78	85	80	83	80	71	69	-	-	88	85
	Max.	94	90	94	86	90	86	82	78	-	-	100	97
	Min.	61	59	73	69	76	72	58	56	-	-	64	61
June	Avg.	94	89	92	87	88	85	82	80	-	-	90	87
	Max.	102	96	99	92	91	88	86	86	-	-	100	97
	Min.	86	84	86	81	81	78	77	74	-	-	78	77
July	Avg.	95	89	90	84	86	83	87	85	87	86	83	82
	Max.	101	96	95	93	90	88	89	87	89	87	91	88
	Min.	89	81	84	78	83	78	82	81	86	85	79	79
Aug.	Avg.	93	89	85	81	89	85	90	88	90	88	79	78
	Max.	99	96	89	85	91	87	93	90	94	91	81	81
	Min.	88	82	81	78	86	83	88	85	86	85	75	75
Sept.	Avg.	94	90	84	79	82	80	92	89	89	87	75	74
	Max.	102	96	89	84	88	87	97	93	94	91	80	79
	Min.	87	87	80	74	75	74	87	84	86	84	70	70
Oct.	Avg.	91	87	82	79	79	76	82	79	80	78	-	-
	Max.	97	93	86	83	87	83	89	86	87	85	-	-
	Min.	87	82	75	72	68	66	77	74	70	67	-	-
Nov.	Avg.	88	83	72	69	68	65	69	67	66	64	-	-
	Max.	94	90	77	74	75	71	80	77	69	68	-	-
	Min.	77	74	61	59	58	57	56	54	63	59	-	-
Dec.	Avg.	72	68	63	60	61	58	58	57	59	57	-	-
	Max.	81	77	69	68	71	68	64	63	64	63	-	-
	Min.	56	53	56	54	52	51	52	52	55	53	-	-

Phenols.

Phenols in industrial wastes, especially from coke plants in steel mills, discharged to the Mahoning River present a pollution problem which has particular significance in the use of the Beaver River for municipal water supply. There is evidence of Phenol in the stream system below the industrial areas along the Mahoning and Shenango Rivers and particularly at the water plants serving the Beaver Falls area. Water containing even very small quantities of phenolic compounds may, after chlorination, carry obnoxious medicinal tastes and odors. Special methods of water treatment, which add to treatment costs, are necessary to combat phenolic tastes.

Commonly used water quality objectives in rivers call for controlling sources of phenolic wastes to assure that phenolic concentrations to not average more than two parts per billion, and that no maximum value exceeds 5ppb. It has been reported that odor tainting of fish flesh begins to persist at phenol concentrations as low as 15 ppb. The Ohio Health Department has stated that it is believed that known practical methods of phenol control will reduce phenol concentrations in the Mahoning at the state line to not more than 75 ppb.

During the week of January 4, 1965, phenol concentrations as high as 250 to 280 ppb were found in a set of samples collected by the Public Health Service in the Mahoning River, in and below the Warren-Lowellville industrial area along the Mahoning River, and a value of 14.5 ppb near the Beaver Falls water intake.

The 1959 to 1961 Pennsylvania study revealed concentrations as high as 220 ppb, and an average of 38 ppb near the mouth of the Mahoning River, and an average of 28 ppb at Beaver Falls.

During a 16-week period in 1959, virtually the entire steel mill industry in the Beaver River watershed was closed by a strike. Other industries were not substantially affected. Subsequently, the Ohio River Valley Water Sanitation Commission (ORSANCO) compared levels of pollutional constituents in the Mahoning River at Lowellville, and the Beaver River at the Beaver Falls water intake, with levels of the same constituents at these points in earlier years (1952, 1953, and 1957) when the steel mills were in operation. Phenols were among those constituents.

During the 1959 strike, phenols at Lowellville averaged 10 ppb, compared to averages in the range of 5 to 44 ppb in the three previous years, for an over-all average of 21 ppb. At Beaver Falls, the average for the 1959 period was 3 ppb.

Taste and Odor.

Taste and odor in municipal water supplies may result from many causes. Among these are oils, phenols, naphthalenes, and other organic materials associated with coke by-production, which may be discharged in wastes from the coke plants normally associated with steel mills.

An indication of the odor potential of water is measured approximately by the threshold odor (T.O.) determination. This is an involved method and is not often used, unless odor in a municipal water supply presents a problem. The ORSANCO report referred to above included data on threshold odor of the Beaver Falls raw water. During the 1959 strike, the T. O. number of the raw water was 19. Even this value is relatively high for a clean stream, except in those situations where the odor is caused by algae. During previous years, while the steel mills were operating, the T. O. number ranged from 41 to 202, for an average of 137, which is seven times the relatively high value that occurred when the steel mills were closed.

To combat tastes and odors, the Beaver Falls water treatment plant is forced to use methods far beyond those of the conventional water treatment plant that obtains water from a source of good quality. These measures require correspondingly increased costs of treatment.

Alkalinity, Acidity and pH.

Natural surface waters normally are moderately alkaline, containing calcium bicarbonate and carbonate and other minor alkaline constituents dissolved from the soil and rock through and over which the water flows. The water also contains mildly acidic salts of certain metals, and the mild carbonic acid, which is derived from carbon dioxide in the atmosphere and from decomposing organic matter. The balance between these mild alkalies and acids controls the pH, or hydrogen ion concentration, of the water. At the pH of 7.0 the opposing alkaline and acidic constituents are in exact balance, and the water is said to be neutral. Natural waters rarely are more alkaline than pH 8.5, or more acidic than pH 6.5.

As a result, fish and other aquatic life generally are acclimated to water with pH in the range of 6.5 to 8.5. Drastic variations in pH outside this range can reduce or eliminate desirable aquatic life. A moderately alkaline water is desirable as a source of water supply, since it is less corrosive to concrete and to pumps, piping, and other metallic equipment than an acidic water. Alkalinity also is essential in the chemical reactions employed in conventional water treatment processes.

Strong acids are used in some industrial processes, such as the sulfuric acid used in large quantities by steel mills. The acid may be discharged untreated, or may be neutralized with lime before discharge. If not neutralized, the acid reduces the natural alkalinity and reduces the pH correspondingly. If all natural alkalinity is destroyed, the pH drops to about 4.2. Additional waste acid will reduce the pH below even this value.

The Aquatic Life Advisory Committee of ORSANCO has concluded that lethal effects on aquatic life are not produced until the pH is reduced below 5.0, but from the standpoint of productivity, it is best to maintain pH above 6.5. Objective by the State of Ohio of pH 6.3 and alkalinity of 30 mg/l have been selected as applicable to the Mahoning River at the state line.

It was estimated by ORSANCO in 1959 that 200 tons per day of acid (as equivalent $CaCO_3$) was wasted by the steel mills in the Beaver River watershed.

In 1959 the alkalinity of the Mahoning River at Lowellville averaged 80 mg/l during the steel mill strike, and in the range of 8 to 30 mg/l in the previous 3 years. Alkalinity was adequate at Beaver Falls during all periods, averaging 69 during the strike, compared to about 54 in previous years, but reflected some effect of acid wastes from upstream.

In 1959 the pH averaged 7.3 at Lowellville, compared to a range of 5.9 to 6.1 in the three previous years.

All pH averages were above 7.0 at Beaver Falls.

The U. S. Geological Survey -- Ohio Department of Health monitoring station maintain a continuous record of pH at Lowellville, with occasional gaps because of instrument failure. The record indicates that there were 28 days in 1964 when the pH dropped below 5.0, with a minimum value of 3.6 on two days. These acidic conditions would retard and probably destroy aquatic life at and below the state line. The record shows 187 days when the pH was below the Ohio objective of 6.3.

All average monthly pH values at the Beaver Falls raw water intake were in the range of 6.8 to 7.2 during 1964. The lowest single daily value was 6.5. These values reflect only slightly the effects of the acid wastes discharged upstream. This represents an improvement over the 1952, 1953, and 1957 values in the range of 5.9 to 6.1 reported by ORSANCO, as noted above. Average monthly alkalinities ranged from 36 to 51 mg/1, which is adequate, but below the 80 mg/1 in 1959 when the steel mills were closed. Daily minimum values were below 30 mg/1 in four months, with the lowest being 20 milligrams per liter.

At this point I would like to insert the most recent data from the Ohio Department of Health. In 1964, 11.3 percent of the observations were below the Ohio objective of 6.3. 1.9 percent of the observations were below the 5 point value.

In the results obtained on the single set of samples collected by the Public Health Service during the week of January 4, 1965, the pH ranged from 6.0 to 6.5 in the vicinity of the state line, and was 7.1 at Beaver Falls. Corresponding alkalinities were in the range of 13 to 23 mg/1 near the state line, and 26 mg/1 at Beaver Falls. The pH at three stations in the Niles to Youngstown reach of the river ranged from 3.6 to 4.2, the natural alkalinity at these three stations being totally destroyed by the acid wastes.

Adverse effects of the acid wastes range from severe to moderate in the river system from Warren to Beaver Falls. The pH was low enough to destroy much of the aquatic life in the Mahoning River below Warren, and the alkalinity was below the level desirable in sources of municipal and many industrial water supplies in the Mahoning and in the Beaver River at Beaver Falls.

Hardness.

Hardness of water is caused primarily by the salts of calcium and magnesium. As hardness increases, the soap and other detergents necessary for effective cleaning increase. Hard water produces scale in household hot water tanks and in metallic equipment in high temperature industrial processes, which reduces the effectiveness of heating.

Hard water can toughen vegetables during cooking. Natural surface waters exhibit various degrees of hardness, depending on the soils and rocks with which they come in contact. The natural alkalinity discussed earlier usually is largely calcium and magnesium carbonate and bicarbonate, which are hardness constituents.

Many heavy industries, including steel mills, use large quantities of limestone, which consists of calcium, and frequently magnesium, carbonate. The principal waste from steel mills that contributes to hardness of the receiving stream is the calcium and magnesium sulfate that result from neutralization of waste acid pickle liquor with limestone or lime.

In the report on river water quality during the 1959 steel mill strike, ORSANCO estimated that the steel mills discharged 90 tons per day of hardness.

The hardness of surface waters varies so widely throughout the country that no limit has been set on hardness in municipal water supplies. Water with hardness less than 125 mg/l usually is considered reasonably soft. In many cases where hardness is in excess of 125 mg/l, special treatment to reduce hardness is considered justified. When softening is employed, it is common to produce water with a hardness of 70 to 80 mg/l. Industries can use water for various processes that may vary in hardness over a wide range. Most of the required limits fall in the range of 100 to 300 mg/1, but others require hardness less than 100 mg/1. For example, the hardness of water used for cooling and for steel manufacturing, which are major uses in the Beaver River Valley, preferably should not exceed 50 mg/1.

At present, data are not available to establish the natural hardness of waters in the Mahoning and Beaver Rivers, but it appears that it may be in the range of 100 to 150 mg/1. The hardness of raw water at the Beaver Falls intake averaged 183 mg/1 in 1964. The 90 tons per day of hardness estimated by ORSANCO to be added by the steel mills would account for a moderate addition of 15 mg/1 of hardness to the average annual flow of the Beaver River at Beaver Falls. ORSANCO data indicated that the hardness was 43 mg/1 less during the steel strike than it was during comparable flow periods in previous years when the mills were operating. The increase in hardness concentrations caused by steel mill wastes would be less during higher stream flow periods.

While there undoubtedly are moderate adverse effects of hardness added by industries on municipal and industrial water supplies on the Mahoning and Beaver Rivers, presently available data do not allow a full evaluation of effects.

Iron.

Iron is relatively insoluble in the presence of oxygen and of the alkalinity within the normal pH range of most natural surface waters. Such waters frequently have low iron concentrations of only a few hundredths to a few tenths of a mg/1. When wastes containing dissolved ferrous iron are discharged to a stream, the iron depletes the D.O. of the stream, adding to the depletion of D.O. by organic wastes. In the process, the iron precipitates and settles to the stream bed, where it coats exposed surfaces, or forms sludge banks that may cover and destroy aquatic life. If the D.O. is totally depleted and if accompanying acid wastes neutralize the alkalinity of the stream, the dissolved iron may remain in solution for many miles downstream and cause difficulties in stream reaches far removed from the point of discharge.

Insoluble forms of iron are relatively inert in water, and usually cause only those difficulties typical of natural silt and other inorganic suspended solids, which destroy the clarity of the water and settle to form bottom deposits.

Even small quantities of dissolved iron in municipal and industrial water supplies can cause problems. It can cause difficulty in water treatment through staining of equipment, especially chlorinators and filter sand. It can cause false readings of chlorine residuals, and thus interfere with the chlorination process that is essential to destroy pathogenic bacteria and protect health. The iron may precipitate as a reddish floc, in the distribution system, causing the familiar "red water" that flows from some faucets. It stains bathroom fixtures and laundry, turns tea black, and may impart an unpleasant taste to water. It can interfere with a variety of industrial processes. Recommended limits for iron are 0.3 mg/l for domestic water supplies and 0. mg/l for industrial supplies.

Much of the data available on iron in the Mahoning and Beaver Rivers does not lend itself to sound interpretation because most of the determinations have been for total iron, both dissolved and in suspension. Since the effects of the two forms on water use are different, it is not possible to evaluate fully the effects on the basis of total iron alone.

For example, the ORSANCO report shows that steel mills in the Beaver River watershed discharged 72 tons per day of dissolved iron and 225 tons per day of iron in suspension. Most of the insoluble iron probably settles to the stream bed within a few miles from the points of discharge. The dissolved iron, on the other hand, undoubtedly carries farther downstream until oxidized.

There is no doubt that the bed of the Mahoning River from Warren to its mouth in Pennsylvania is a depository of large quantities of iron. Reclaiming operations in the Mahoning River at Youngstown are being employed to separate iron deposits from river bottom sludge.

Concentrations of iron (chiefly mill scale discharges from steel mills) are apparently great enough to make this operation economical. A hydraulic dredge is employed to remove the deposits from the river, after which the heavy iron materials are settled out and thereby reclaimed. The remaining materials are then respread on the river bottom under surveillance by the Corps of Engineers. The amount of iron recovered is not known, although one report indicated that in one area recovered particles tested from 40 to 52 percent iron. Approximately 4½ river miles have been covered by the recovery operations thus far, and plans call for an additional 2½ miles to be recovered in the near future.

Manganese. Manganese is quite similar to iron in many of its reactions, and most of the above discussion on iron applies to manganese. Manganese probably reacts more slowly than iron, but the discolorations and deposits of various kinds that it can cause are black, and therefore even more objectionable than those caused by iron.

Interferences by manganese with domestic and industrial water uses are even more severe than those by iron, and therefore a lower limit of 0.05 mg/l has been proposed for manganese in both domestic and many industrial supplies.

The ORSANCO report estimated that the steel mills normally discharged 1.8 tons per day of dissolved manganese. The 1964 operating records of the Beaver Falls water treatment plant show that manganese in the raw water ranged from 0.10 to 1.35 mg/l, with an annual average of 0.39 mg/l. This is far above the manganese level of most natural surface waters, which rarely exceed a few hundredths of a mg/l.

Fluorides.

It is recognized that fluorides, within optimum limits of 0.7 to 1.2 mg/l in drinking water, are beneficial in protecting the teeth of children against decay, or caries. Continuous ingestion of water containing fluorides much in excess of the upper limit can cause unslightly mottling of teeth.

Fluorides are discharged in the wastes from steel mills, electric lamp manufacture, and zirconium production in the Beaver River Valley. Although a few values reported for the Mahoning River have been in the range of 2.4 to 3.2 mg/l, which is above the desirable limit for drinking water, there is no evidence that the limit has been exceeded at the Beaver Falls water intake, but rather that fluorides have been below the optimum lower limit.

It may be assumed that children drinking water from the Beaver Falls municipal supply may have received some protection of their teeth because of the fluorides discharged upstream. It should be realized, however, that the fluoride concentrations vary considerably and presumably rapidly at times. If the municipality should desire to provide maximum protection of the children's teeth through controlled fluoridation, as is practiced in many cities, the varying concentrations in the raw water would render it difficult to ensure proper dosage of fluorides to achieve the optimum concentration in the treated water.

Ammonia.

Ammonia in surface waters comes from the decomposition of organic matter, and in clean water rarely exceeds a few tenths of a mg/l. Ammonia is a constituent of municipal sewage and of wastes from coke plants commonly included in steel mill operations.

A concentration of 2.5 mg/l of ammonia is considered to be harmful to fish if the pH of the water is in the range of 7.4 to 8.5. Toxicity decreases with decreasing pH. It has been found that concentrations of 1.5 mg/l or less are not harmful to most varieties of fish. Ammonia in the raw water of treatment plants requires compensating quantities of chlorine in plants where free residual chlorination, the most effective method of bacterial disinfection, is practiced. Each mg/l of ammonia requires about 8 mg/l of chlorine before a free chlorine residual can be obtained. This can cause a significant increase in the cost of water treatment.

Data on ammonia in the Mahoning River at Lowellville are available in the U. S. Geological Survey Records for the water years (October through September) 1958, 1959, and 1960. The annual average concentrations of ammonia (as NH_3) are remarkably constant, at 3.3, 3.3, and 3.2 mg/1. Individual values, however, frequently have been in the range of 6.0 to 8.0 mg/1. Such concentrations almost certainly would destroy any fish that might be present in the Mahoning. Even after dilution with the Shenango River to form the Beaver, the resulting concentrations of ammonia probably would be harmful to fish.

Although no data on ammonia at the Beaver Falls water intake are available, it is certain that ammonia concentrations sufficiently high to add significantly to the chlorine requirements of water treatment persist to the intake.

Cyanides.

Cyanides in water are toxic to fish in low concentrations. Cyanides are included in the wastes from coke plants and, therefore, frequently occur in steel mill wastes. Cyanides also are used extensively in metal plating operations.

The Aquatic Advisory Committee of the Ohio River

Valley Water Sanitation Commission recommended that free cyanide in excess of 0.025 mg/1 be considered unsafe in the Ohio River. In the Mahoning River, which has low D. O. and pH, and relatively high ammonia, all of which increase the toxicity of cyanides, a given concentration of cyanide would be expected to be even more toxic than the same concentration in the Ohio.

Few data on cyanides in the Mahonig River have been found. The results of 15 determinations on the river at Lowellville during the period of November 1952 through September 1953 have been reported by ORSANCO. The values ranged from 0 in one-third of the samples to as high as 1.0 mg/1. The average of all results was 0.25 mg/1, which is 10 times the recommended limit. All 10 of the positive results exceed the limit by factors of 4 to 40 times.

Some of the cyanide concentrations reported at Lowellville in 1952-1953 would have been lethal to any fish that might have been in the river at that time. There is no known reason to assume that cyanide wastes have been reduced significantly since that time.

Here, I would like to recognize the fact that Mr. George Eagle said that treatment had been provided for the cyanide sources on the Mahoning River.

There is no evidence that cyanides have occurred in the raw water at Beaver Falls in concentrations sufficient to be harmful to consumers of the water supply.

Visual Evidences of Pollution.

During the week of January 4, 1965, Public Health Service personnel observed the Mahoning, Shenango, and Beaver Rivers at numerous points in connection with the collection of stream samples.

From Warren, Ohio, to the mouth of the Mahoning, from Sharon, Pennsylvania, to the mouth of the Shenango, and from the confluence of these two streams, the surfaces of the three streams were covered with an oily film.

Along the Mahoning River black, oily sludge lined the banks, and masses of these materials hung from bushes and tree limbs near the water's edge.

In and below the Youngstown area, gobs of dark greasy material bobbed up and down in the water as they moved along with the current.

The scenic values of the Mahoning River below Warren have been destroyed, and those of the Shenango and Beaver seriously damaged.

CHAIRMAN STEIN: Thank you, Mr. Kittrell. Are there any comments or questions at this point? And maybe we will have an opportunity to question Mr. Kittrell at the conclusion of his report.

Mr. Boardman.

MR. BOARDMAN: Back on page 24 of Mr. Kittrell's statement it was indicated that Pennsylvania has a water quality, -- I object to that it was indicated that Pennsylvania has a water quality objective of 4 milligrams per liter dissolved oxygen in the lower Mahoning, Shenango, and Beaver. Pennsylvania has not established a definite water quality objective for any of these streams at the present time.

CHAIRMAN STEIN: Do you have any comments, Mr. Kittrell?

MR. KITTRELL: Mr. Chairman, this information was brought to me by one of my field men.

MR. BOARDMAN: I believe the information was obtained from a draft report from our regional office. There is no official status to that report.

MR. POSTON: Thank you, Mr. Kittrell.

MR. CLEARY: May I ask a question?

CHAIRMAN STEIN: Certainly.

MR. CLEARY: I have a couple of questions of Mr. Kittrell. On page 28, at the bottom of the page, it says a value of 14.5 parts per billion near the Beaver Falls water intake were noted with respect to phenol concentrations.

My question is: Do you have any taste and odor data that would indicate what happened as a result of that level of phenols at that time?

MR. KITTRELL: No, we have not.

MR. CLEARY: The reason I raise it is because I believe there is a professional difference of opinion with respect to what constitutes a level where taste and odors become prevalent. I notice you mention three parts per billion; five parts per billion is another number, and I raise the question simply to see whether this would help cast some light on the question.

CHAIRMAN STEIN: Mr. Cleary, I wonder, we are, I understand, going to have Dr. Graham Walton, who is our water supply expert, on soon. It may be advisable to raise these questions again and check with him.

MR. CLEARY: Would that be also true with respect to manganese, fluorides?

CHAIRMAN STEIN: I would suggest that any effect on drinking water supply may best, in the interest of our most authoritative information, be directed to Dr. Walton.

MR. CLEARY: Would this be appropriate -- I was going to ask about the manganese level in some of the reservoirs. Would that be a question for

Dr. Walton?

CHAIRMAN STEIN: Is this supposed to affect public water supplies?

MR. CLEARY: What I am getting at, maybe you better let me proceed, Mr. Chairman. My question was simply this: On page 38, this deals with the matter of manganese in the river. My question, Mr. Kittrell, was simply this: Has any information been developed with respect to the manganese that may be in the reservoirs and when flow regulation is attempted, then the concentrations may reflect what the manganese level was in the reservoirs?

MR. KITTRELL: This is a distinct possibility. We do not have any information to show whether this occurs or does not, but it is a possibility.

MR. CLEARY: The reason I raise the question, Mr. Chairman, is simply where is the manganese coming from, and I thought this might cast some light on it.

And my other question, finally, on page 39 mention was made of some fluoride measurements in the Mahoning. Would you recall, Mr. Kittrell, where they were made? I heard some testimony this morning that fluorides, hydrofluoric acid was being discharged by lamp works, and I was wondering, was this in the vicinity of the lamp works in the Upper Mahoning or where else?

MR. KITTRELL: This was in the vicinity of the lower U. S. Geological Station at Lowellville.

MR. CLEARY: Thank you.

CHAIRMAN STEIN: Thank you. Are there any other questions of Mr. Kittrell at this time? If not, thank you. Mr. Poston.

MR. POSTON: Thank you, Mr. Kittrell. We will now hear from Mr. Kenneth Mackenthun who will talk about the biological effects.

MR. MACKENTHUN: Aquatic Life.

Environments in which aquatic organisms live are often changed by man-produced pollution. These changes are reflected in the kinds and numbers of aquatic plant and animal life that may persist. Unpolluted water courses support many different kinds of clean-water-associated bottom organisms such as stoneflies, mayflies, caddisflies and alderflies. Pollution-tolerant forms such as certain leeches and sludgeworms may be present in unpolluted water, but usually are few in numbers. Stream conditions that permit the development of an assemblage of clean-water-associated organisms provide food for fishes and prevent development of nuisance organisms in large numbers.

Responses of aquatic organisms to domestic and industrial wastes depend largely on the amounts and kinds of such materials entering their environments. One response is manifest by the loss of a few kinds of organisms that thrive only in clean water environments, while those that may be associated with mildly polluted waters increase slightly in numbers. A more drastic response involves the disappearance of all clean-water-associated forms and the development of pollution-tolerant organisms often associated with sludges and slimes. Yet another response is associated with environments that are toxic to certain organisms and in which there is a substantial reduction in numbers of most forms and an elimination of many. In severely toxic environments, no organisms exist.

A biological survey to evaluate bottom organism population in the Mahoning, Beaver, and Shenango Rivers was made during the week of January 4, 1965.

Bottom organisms were reduced in numbers from over 2,000 per square foot upstream from Newton Falls, Ohio, to about 300 per square foot at Lowellville, and 850 per square foot at the first bridge crossing downstream from the Ohio-Pennsylvania state line (Table 9, Figures V and VI). Similarly, 9 and 11 different general kinds of organisms were found in the West Branch and East Branch, respectively, upstream from Newton Falls. Only one kind, a pollution-tolerant organism, was found at Lowellville, and three kinds were found at the first bridge crossing downstream from the state line.

Although few in numbers downstream from Newton Falls, clean-water-associated organisms were found downstream to the Highway 422 bridge just upstream from Warren, Ohio. Clean-water-associated organisms were not found throughout the remainder of the Mahoning River.

Only pollution-tolerant sludgeworms persisted at Lowellville, and only pollution-tolerant sludgeworms and leeches and one kind of tolerant snail were found at the next station downstream of the state line.

The absence of clean-water-associated fish food organisms in the Mahoning River downstream from Warren, Ohio, the severe decrease in the diversity of bottom organisms, and the decrease in the bottom organism population attests to the severely polluted condition of the river from Warren, Ohio, to its confluence with the Shenango River in Pennsylvania.

The bottom of the Mahoning River throughout the reach studied was generally rock and rubble with sludge along the shores and in many slack water areas. Such a rubble substrate would be expected to support a bountiful fish food organism population, if not polluted. In many areas, oil formed a film on the water's surface, adhered to twigs, shoreline grasses and debris, and became mixed with the sludges. Substrate rocks and rubble were covered with a thick iron deposit that was harmful to bottom organisms in the Lowellville-state line reach.

Conditions of existence were only slightly improved in the Beaver River. Sludgeworm populations were reduced from those found in the more polluted reaches of the Mahoning River indicating a reduction in the organic food supply. At New Brighton, Pennsylvania, partial stream recovery was found. The different kinds of organisms had increased and stoneflies were observed in small numbers on rocks in the shallow water near the shore. These were not found in quantitative samples taken from deeper water where the impact of pollution would be expected to be greatest.

Oil was also found throughout the Beaver River.

(See next page.)

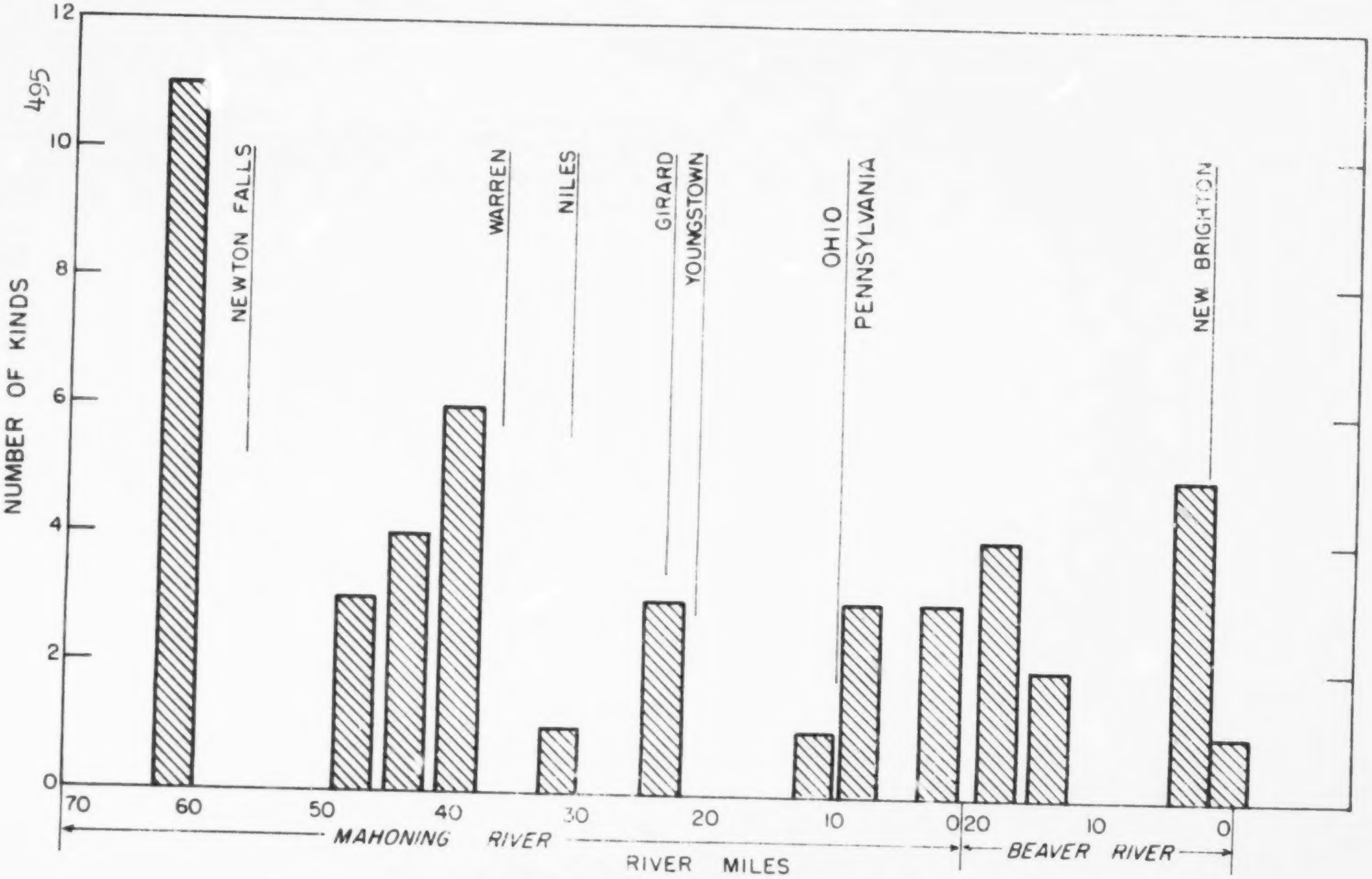
Table 9

Mahoning, Shenango, and Beaver Rivers
Bottom Organisms per Square Foot
January 1965

Mileage / Organisms	Mahoning River: West Branch Upstream fr. Newton Falls M-55.3-3.5	East Branch Pricetown 61.3	Hy 5 47.4	Park Rd. 43.2	Downstream fr. Power Dam 41.5	Hy 422 39.5	Upstream fr. Niles 31.3	Girard 23.6	Lowellville 11.4	Downstream fr. State Line 9.4	Hy 18-108 2.0	Beaver River: Hy 168 18.0	Wampum 14.0	New Brighton 2.0	1 mile Upstream fr. Ohio River 1.0	Shenango River: Upstream fr. Sharpsville 26.0	Hy 718 22.0	Upstream fr. New Castle 5.0	Downstream fr. New Castle 3.0
Stoneflies	●	-	-	-	-	-	-	-	-	-	-	-	-	●	-	5	-	-	-
Mayflies	●	10	-	-	-	-	-	-	-	-	-	-	-	-	-	26	-	-	-
Caddisflies	●	1374	1	2	4	3	-	-	-	-	-	-	-	-	-	408	-	-	-
Alderflies	-	-	-	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-
Riffle Beetles	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	71	-	-	-
Crane flies	●	-	-	-	●	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Snipeflies	●	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Black Flies	●	74	-	-	1	1	-	-	-	-	-	-	-	2	-	85	-	-	-
Scuds	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Limpets	-	20	-	-	-	-	-	-	-	-	-	18	-	2	-	5	-	-	-
Roundworms	●	1	-	-	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Snails	●	3	-	-	-	-	-	3	-	5	2	38	20	-	-	-	7	-	-
Fingernail Clams	-	31	-	1	-	1	-	-	-	-	-	-	-	-	-	-	-	-	-
Midges	●	548	1	3	1	57	-	-	-	-	-	-	-	31	-	493	-	-	3
Leeches		1	-	-	-	-	-	3	-	4	56	7	3	-	-	-	20	-	-
Sludgeworms	-	18	22	15	1	289	323	3	294	850	5	1	-	114	132	-	90	66	2
Total Kinds	9	11	3	4	6	6	1	3	1	3	3	4	2	5	1	7	3	1	2
Total Per Sq. Foot	-	2081	24	21	10	354	323	9	294	859	63	64	23	150	132	1093	117	66	5

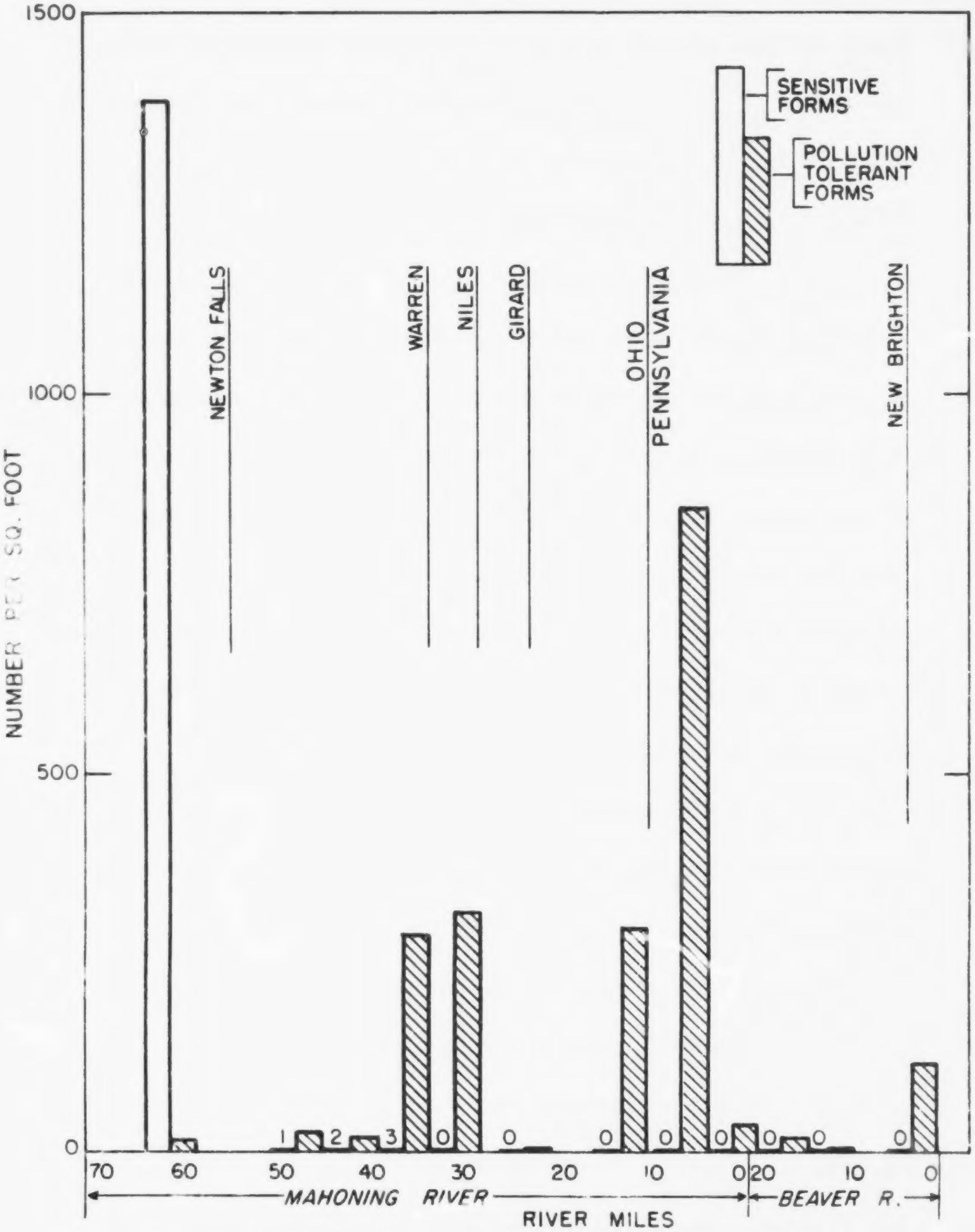
● Appeared in qualitative sample only; counted as one in totals.

494



MAHONING - BEAVER RIVERS
KINDS OF BOTTOM ORGANISMS
JANUARY 1965

FIGURE V



MAHONING - BEAVER RIVERS
BOTTOM ORGANISM DATA
JANUARY 1965

FIGURE VI

Many of the bottom rocks were red in color and showed evidence of an iron precipitate. Colonizing the rock's surface in shallower waters was a growth of slick, slimy algae often characteristic of polluted water.

Fisheries investigators have reported that the Mahoning River does not support a catchable fish population downstream from Warren, Ohio, to its confluence with the Shenango River, and that the Beaver River supports a catchable fish population only in its lower reach in the New Brighton area. This was substantiated by an examination of the bottom organism population. In those areas where fishing was not reported, there were no bottom organisms on which fish normally feed.

The Shenango River was examined from the reach near the Sharpsville, Pennsylvania, water plant to its confluence with the Mahoning River (Table 9). Downstream from Sharon, few bottom organisms were found and conditions of existence for the bottom forms were similar to those observed on the Mahoning River.

Results of an examination of the phytoplankton population, which is actually the drifting algae, were similar to those found for the bottom organism population. Values of total counts in the East and West Forks of the Mahoning River upstream from Newton Falls, Ohio, were in a range that would be expected in an unpolluted stream during the winter months (Table 10, Figure VII). Downstream from the U. S. Highway 5 bridge (mile 47.4) total count values were substantially depressed and remained depressed throughout the remainder of the Mahoning River. At Lowellville, Ohio, and at the first bridge crossing downstream from the Ohio-Pennsylvania state line, total count values were one-fourth of those upstream of Newton Falls. Some recovery was found at the Highway 18 bridge upstream from the confluence of the Mahoning River with the Shenango River. Depressed algal counts demonstrate the degrading effect of pollution on this primary food source for aquatic life in the stream. The low phytoplankton total count values and the low population numbers found in the bottom organism population is strongly suggestive of the action of a toxic substance or substances to aquatic.

Phytoplankton total count values were likewise depressed in the Beaver River, but were higher than those in the severely polluted reach of the Mahoning River.

In the Shenango River upstream from Sharpsville, Pennsylvania, phytoplankton counts were comparable to those found in unpolluted reaches of the Mahoning River (Figure VIII). Downstream from Sharon, counts were severely depressed. Some recovery was found upstream from New Castle, but wastes from New Castle reduced the counts

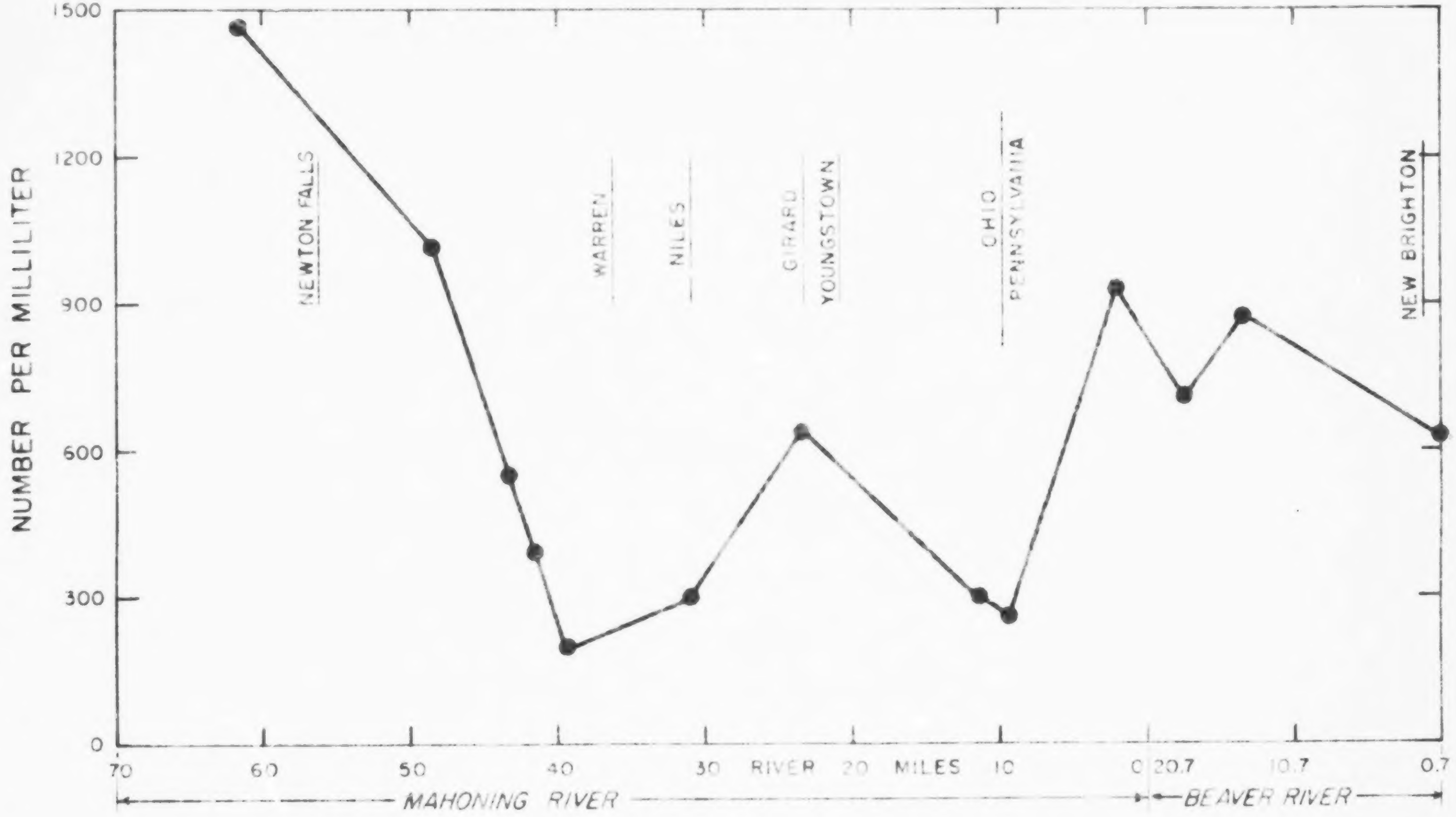
TABLE 10

MAHONING-BEAVER AND SHENANGO RIVERS

PHYTOPLANKTON DATA

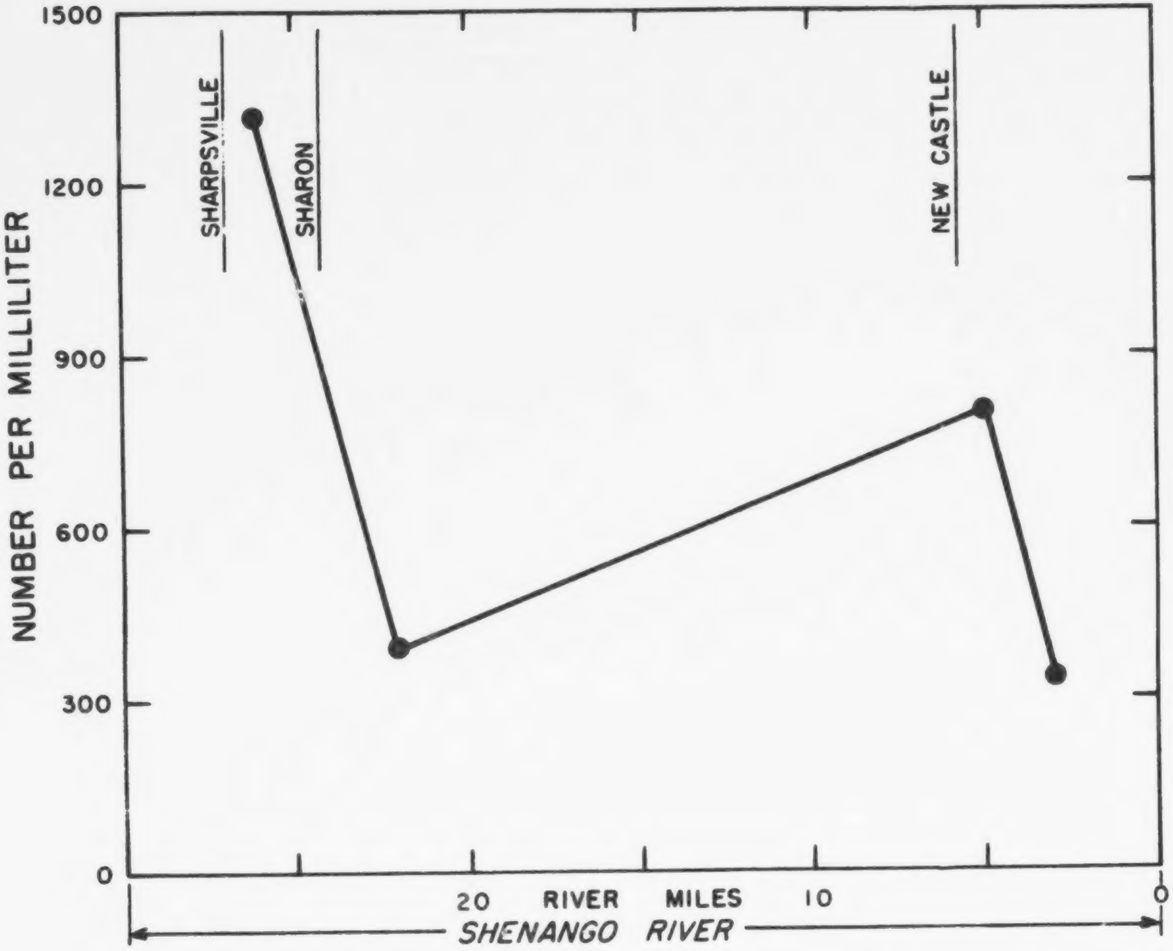
TOTAL NUMBERS PER MILLILITER

STATION	DESCRIPTION	RIVER MILE	TOTAL/ml
East Fk. Mahoning R.	Pricetown Bridge	61.3	1,450
West Fk. Mahoning R.	Upstream from Newton Falls, Ohio	55.3-3.5	1,300
Mahoning R.	U. S. Hwy 5 Bridge	47.4	1,050
	Park Road Crossing	43.2	550
	Downstream from Power Dam	41.5	400
	U. S. Hwy 422 Bridge	39.5	200
	Upstream from Niles	31.3	300
	Girard	23.6	650
	Lowellville	11.4	300
	Ohio-Pennsylvania State line	10.4	
	1st Bridge downstream from State Line	9.4	250
	Hwy 18 & 108	2.0	950
Beaver R.	U. S. Hwy 168	18.0	700
	Wampum, Pennsylvania	14.0	850
	1 mile upstream from confluence with Ohio River	1.0	650
Shenango R.	Upstream from Sharpsville	26.0	1,350
	Hwy 718	22.0	400
	Upstream from New Castle	5.0	800
	Downstream from New Castle	3.0	350



MAHONING - BEAVER RIVERS
TOTAL PHYTOPLANKTON PER MILLILITER

FIGURE VII



SHENANGO RIVER PHYTOPLANKTON
TOTAL NUMBERS PER MILLILITER

FIGURE VIII

just prior to the confluence of the Shenango River with the Mahoning River.

In general, the absence of clean-water-associated fish food organisms in the Mahoning River, downstream from Warren, Ohio, the severe decrease in the diversity of bottom organisms, and the decrease in the total bottom organism population attests to the severely polluted condition of the river from Warren,Ohio, to its confluence with the Shenango River in Pennsylvania. Conditions of existence were only slightly improved in the Beaver River although partial stream recovery was found at New Brighton, Pennsylvania. Results of the examination of the phytoplankton population were similar to those found for the bottom organism population. Where low phytoplankton total count values and low population numbers in the bottom organism population were found, it is strongly suggestive of the action of a toxic substance or substances to aquatic life. The production of a fish population in the polluted reaches of the Mahoning and Beaver Rivers would be affected similarly to the bottom organism and plankton populations. Fish production would be severely curtailed or eliminated from Warren, Ohio, on the Mahoning River to its confluence with the Shenango River, and on the Beaver River downstream to the New Brighton, Pennsylvania area.

CHAIRMAN STEIN: Thank you, Mr. Mackenthun. Are there any comments or questions? If not, thank you.

DR. ARNOLD: I would like to ask a question. I would like to know, when were these observations made on the river that you are giving in this report?

MR. MACKENTHUN: These observations were made during a biological survey conducted during the week of January 4, 1965. That was in the report. I neglected to read that paragraph.

CHAIRMAN STEIN: Mr. Cleary.

MR. CLEARY: Mr. Chairman, Mr. Mackenthun, a question to my enlightenment. Would you have any opinion as to what the conditions might be with respect to the aquatic life at a different season of the year? This was measured in an undoubtedly cold period. Would the conditions be probably worse or better? Would you care to express an opinion on that?

MR. MACKENTHUN: One could only predict from experience on a question of that nature. I would assume that from the bottom organism population, I would not expect too drastic a change comparing one season with another. This statement might not hold true for the phytoplankton or the floating algae population since it is much more subject, of course, to season change.

MR. CLEARY: Thank you very much.

CHAIRMAN STEIN: Are there any further comments or questions? If not, thank you, Mr. Mackenthun.

MR. POSTON: We will now hear from Dr. Graham Walton on Municipal Water Treatment at Beaver Falls.

DR. WALTON: The Beaver Falls Municipal Authority operates the Eastvale and New Brighton water plants which treat water taken from the Beaver River. These plants jointly supply water to the City of Beaver Falls, nine boroughs and six townships. The population served is estimated to be 65,000.

The Eastvale plant, records from which are analyzed in this report, is located in Beaver Falls, a few miles upstream from the New Brighton plant. The Eastvale plant was constructed in 1922. In 1957 and 1958, a new chemical house with chemical handling and feed equipment, new flocculation and settling tanks providing for two-stage coagulation and settling, and new filters were added. Present rated capacity is 10 mgd.

Raw Water Quality.

The Beaver River is the source of the water treated at the Eastvale and New Brighton plants. Raw water quality data from the 1964 Eastvale Filter Plant operation reports are summarized in Table 7.

The coliform bacterial density, which is a measure of sewage pollution, averaged 31,000/100 ml. This is the same order of magnitude as found for this water source in a study conducted by the Public Health Service during 1954-1956. That study reports data from 54 water plants, which were carefully selected in an effort to include all plants treating water grossly polluted with sewage and having adequate data for the study. When these plants were coded in order of decreasing annual average coliform bacterial density in their raw water, the Eastvale plant was No. 14. Only 13 of these 54 plants treated waters more heavily polluted with sewage insofar as indicated by the annual average colifrom densities.

The threshold odor numbers, which are reported to be estimated values, ranged from 20 to 200. Addition of one-fourth teaspoonful of water having a threshold odor of 200 to a cup of odorless hot water would result in detectable odor. These odors are described in plant records by such notations as D (disagreeable), *M (musty), E(earthy), Ch (hydrocarbon), stale, tar, and Ds (septic).

The concentration of iron averaged 0.87 mg/1, with high values of 5 and 50 mg/1 being recorded for individual analyses. The manganese concentration averaged 0.39 mg/1

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*It is assumed that the coding describing the odors is that given in Standard Methods, 11th Edition.

with individual analyses of 0.80 or more mg/l in each of six of the 12 months.

Both iron and manganese are highly objectionable constituents in a municipal water supply. The domestic consumer complains of the brownish color that they impart to laundered goods, and of the impairment of taste of beverages, including coffee and tea. Many commercial and industrial processes are affected adversely by the iron and manganese.

The average hardness of the untreated water was 184 mg/l.

The Ohio River Valley Water Sanitation Commission's study of the Beaver River at Eastvale during July 20 to December 7, 1959, showed phenol concentrations ranging from 0 to 35 mg/l and fluoride concentrations ranging from 0.2 to 0.7 mg/l.

The gross and variable pollution present in the Beaver River at the Eastvale intake shows that abnormal treatment measures are required to produce a safe and palatable municipal water supply.

Water Treatment.

The Eastvale plant has facilities for two-stage coagulation and settling, for rapid sand filtration and for handling and feeding alum, lime, chlorine, chlorine dioxide, potassium permanganate and activated carbon.

The treatment process is varied as considered desirable to provide adequate purification, including removal of iron, manganese and obnoxious taste and odor. Throughout three to five months of the year chlorination to provide free residual chlorine in the treated water is practiced. When free residual chlorination is not practiced, extensive use is made of chlorine dioxide, potassium permanganate and activated carbon, chemicals which ordinarily are not required at plants treating a good quality raw water. Chemical application during 1964 are summarized in Table 11. Chlorination records at this plant are particularly interesting.

Chlorination of water is used primarily to kill bacteria and other infectious organisms. At the Eastvale plant it is used also to reduce taste and odor and to precipitate iron and manganese.

The amount of chlorine required to treat a water is one measure of its pollution. The average annual chlorine applications, which were 8.9, 8.0, and 8.6 mg/l, for the years 1964, 1963, and 1962, indicate gross pollution of the source water. The chlorine requirements at the Eastvale plant are compared with those at 20 water plants treating some of the most grossly polluted waters in the United States.

Table 12, tabulates, in order of decreasing chlorine

Table 11

Chemical Applications in Treatment of Water, 1964
Eastvale Plant, Beaver Falls Municipal Authority

Month		Water Treated mgd	Pound/mg					
			Alum	Lime	Chlorine	Sodium Chlorite	Activated Carbon	Potassium Permanganate
Jan.	Ave.	4.25	133	103	22.8	1.4	19.6	[redacted] //
	Max.	5.24	201	124	25.7	2.5	32.7	2.0
	Min.	3.28	66	92	15.4	0.0	15.2	0.9
Feb.	Ave.	3.81	108	83	14.1	0.8	18.1	1.1
	Max.	4.59	167	104	19.2	3.1	35.8	1.4
	Min.	2.95	72	73	12.9	0.0	0.0	1.0
March	Ave.	4.09	211	122	41.1	0.8	13.8	0.9
	Max.	5.75	541	165	76.9	2.1	38.5	2.9
	Min.	2.73	90	75	14.7	0.0	0.0	0.0
April	Ave.	3.63	177	131	57.4	0.0	0.0	0.0
	Max.	4.42	358	210	93.6	0.0	0.0	0.0
	Min.	2.86	86	99	34.0	0.0	0.0	0.0
May	Ave.	3.74	176	162	79.9	0.0	0.0	0.0
	Max.	4.94	276	222	145.4	0.0	0.0	0.0
	Min.	2.84	82	106	44.6	0.0	0.0	0.0
June	Ave.	4.03	181	145	68.4	0.0	0.0	0.0
	Max.	5.38	442	333	220.2	0.0	0.0	0.0
	Min.	2.46	110	71	37.6	0.0	0.0	0.0
July	Ave.	4.04	155	216	123.1	0.0	10.9	0.0
	Max.	4.82	207	337	221.4	0.0	36.2	0.0
	Min.	2.90	90	92	29.3	0.0	0.0	0.0
Aug.	Ave.	3.83	128	293	164.8	0.0	0.0	0.0
	Max.	4.37	184	450	267.2	0.0	0.0	0.0
	Min.	2.19	79	174	95.8	0.0	0.0	0.0
Sept.	Ave.	4.01	102	327	200.0	0.2	5.5	0.2
	Max.	5.02	133	573	506.8	1.4	27.7	1.3
	Min.	3.16	52	96	38.2	0.0	0.0	0.0
Oct.	Ave.	3.77	119	139	38.3	1.2	22.8	1.3
	Max.	4.71	213	200	48.8	1.8	31.7	1.8
	Min.	3.31	77	117	29.6	0.0	0.0	0.9
Nov.	Ave.	3.62	168	149	32.3	0.0	0.0	1.4
	Max.	4.17	367	198	44.6	0.0	0.0	1.9
	Min.	3.12	110	124	26.5	0.0	0.0	1.1
Dec.	Ave.	3.76	170	118	25.3	0.0	0.0	1.4
	Max.	4.42	292	160	30.3	0.0	0.0	1.8
	Min.	2.94	100	93	23.1	0.0	0.0	1.1

Table 12

Chlorine Application at Water Plants Treating Grossly Polluted Water (In order of decreasing magnitude)

Plant No.	Years of Record	Average Chlorine Application, mg/l	Comments
1	2	14.5	Industrial supply, total chlorine residual averaged 5 mg/l.
2	2	11.4	
3	2	9.6	Free residual chlorination
Eastvale	1	8.9	(1964) See Footnote
Eastvale	1	8.6	(1962)
4	2	8.4	Free residual chlorination
5	2	8.2	
Eastvale	1	8.0	(1963) See Footnote
6	2	7.9	
7	2	7.1	
8	2	7.0	
9	2	6.6	
10	2	6.4	
11	2	6.3	
12	2	5.9	
13	2	5.7	
14	2	5.3	
15	2	5.3	
16	2	5.2	
17	2	4.6	
18	2	4.6	
19	2	4.4	
20	2	4.3	

At the Eastvale Plant the average chlorine application for 154 days in 1964 during which free residual chlorination was practiced was 16.5 mg/l, and for 103 days in 1963, 22.1 mg/l.

application, data from the 1954-1956 Public Health Service Study of 54 water plants carefully selected to include those plants treating grossly polluted waters.

Plant 1 applied the greatest amount of chlorine, 14.5 mg/l. The treated water contained 5 mg/l of chlorine, and was used only for industrial cleaning operations.

Plant 2 applied 11.4 mg/l of chlorine and Plant 3 was able to practice free residual chlorination with an average application of 9.6 mg/l. Only three of these 20 plants applied chlorine dosages greater than the 8.9 mg/l required at the Eastvale plant in 1964. Although some of these water plants presently may be applying greater chlorine dosages than at the time of the Public Health Service Study, the chlorine applications at the Eastvale plant are among the highest used at water plants in the United States. Still more chlorine would be required if the Eastvale plant continuously practiced free residual chlorination.

During 154 days of such operation in 1964, the chlorine requirement average 16.5 mg/l; and during the 103-day period in 1963, it averaged 22.1 mg/l. Maximum daily chlorine applications of 60.7 and 43.3 mg/l occurred during 1964 and 1963, respectively.

I might note that that is total chlorination, both pre- and post-, and not just pre- as I think was cited by Mr. McBride earlier today. Given a good water source, free residual chlorination should be obtainable using annual average chlorine applications or only 3 or 4 mg/1, with maximum daily applications about 6 to 8 mg/1. The operation reports show substantial increases of chlorine applications occur from one day to the next.

The increase in chlorine, and this is total chlorine application, based on daily averages from September 13, 1964, to September 14, 1964, was better than 23 milligrams per liter.

MR. CLEARY: Excuse me, was that September 13, 1964?

MR. WALTON: '64, both dates were '64. Mr. McBride cited a high chlorine application of 58.5, I believe, this morning, on September 14, 1964. This is pre-chlorination, by the way, only. I am giving the total chlorine application, both pre- and post-, on September 13 and September 14 and the difference.

Rapid and sudden increases in chlorine needs in excess of 10 milligrams per liter require more than normal care to insure adequate disinfection.

The orthotolidine colorimetric test for residual chlorine is used at the Eastvale plant to measure combined residual chlorine in the treated water throughout approximacely eight months each year. If iron or manganic manganes are present in the treated water in amounts exceeding 0.3 mg/1 and 0.01 mg/1, respectively, the development of the yellow color upon addition of the orthotolidine cannot be accepted as being due to chlorine alone. Unless allowances are made for such false test results, the plant operator may be misled into believing adequate disinfection of the water has been accomplished.

Chemical costs per million gallons of water treated are given in Table 13. This table also shows the estimated costs attributed to pollution. For the period 1962 through 1964, this extra chemical cost averages $4.50 per million gallons, and if applied to two billion gallons per year of water treated by the two plants operated by the Beaver Falls Municipal Authority, it would amount to $9,000 annually.

(See next page.)

Table 13

Chemical Costs per Million Gallon of Water Treated, Eastvale Plant, Beaver Falls Municipal Authority

Chemical	Costs* cents/pound	Year		
		1962	1963	1964
Alum	2.36	3.94	4.38	3.62
Lime	0.93	1.44	1.56	1.54
Chlorine	4.92	3.54	3.12	3.64
Chlorite	53.	0.41	0.26	0.20
Carbon	7.98	1.57	1.35	0.62
Potassium Permanganate	27.84	0.24	1.60	1.65
Cost of Chlorite, Carbon, Potassium Permanganate		2.22	3.41	2.47
Cost of Chlorine for application above 4 mg/l or $1.62/mg		1.92	1.50	2.02
Cost of chemicals due to poor quality water		4.14	4.91	4.49

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*Current costs as given by S. P. McBride, January 20, 1965

Quality of Treated Water.

Data presented in the Eastvale Filter Plant operation reports show that in spite of the grossly polluted water source, the plant produced a treated water (at plant outlet) in which no coliform bacteria were detected, free from turbidity, practically free from color, and having an iron content below the limiting concentration considered acceptable for municipal water supplies by the Public Health Service Drinking Water Standards (See Table 14).

Manganese concentrations in excess of 0.05 mg/1, which is the maximum concentration considered acceptable in good public water supplies, was reported for 33 days during 1964. Monthly average concentrations were 0.06 mg/1 during June and July.

Manganese is an objectionable constituent in a public water supply. It stains plumbing fixtures, imparts a brownish to black color in laundered goods, and impairs the taste of coffee and tea. Many commercial and industrial processes are affected adversely by the manganese content of water.

Threshold odor, which reported to be estimated, exceeded the recommended value of three, but only on 11 days during 1964.

An undesirable characteristic of this water is its hardness, which has increased with time as shown in

Table 14

Quality of Treated Water at Plant
Eastvale Plant, Beaver Falls Municipal Authority

1964		Alkalinity as CaCO3, mg/1	Acidity as $CaCO_3$, mg/1	Turbidity	Color	pH	Odor	Hardness as $CaCO_3$ mg/1	Iron mg/1	Manganese mg/1	Chlorine Residual mg/1	Coliform Bacteria per 100 ml r.T.
	Ave.	56	3	0	.4	7.5	-	215	.03	0.03	1.3	0
Jan.	Max.	82	5	0	3	7.6	3	264	.08	.20	1.5	0
	Min.	30	2	0	0	7.5	2	140	.0	.00	0.3	0
	Ave.	50	3	0	.7	7.5	-	210	.03	.01	0.8	0
Feb.	Max.	75	4	0	3	7.6	2	238	.05	.10	0.8	0
	Min.	38	3	0	0	7.4	2	174	.0	.00	0.8	0
	Ave.	38	2	0	.6	7.5	-	158	.03	.03	0.8	0
Mar.	Max.	68	4	0	3	7.6	3	246	.05	.20	1.2	0
	Min.	20	1	0	0	7.2	2	100	.01	.00	0.5	0
	Ave.	37	1	0	0	7.5	-	145	.03	.00	0.6	0
Apr.	Max.	48	3	0	0	7.8	3	182	.08	.00	0.7	0
	Min.	25	0	0	0	7.3	2	128	.01	.00	0.4	0
	Ave.	44	2	0	.5	7.5	-	172	.07	.00	0.6	0
May	Max.	54	4	0	2	7.6	4	216	.15	.05	1.0	0
	Min.	35	1	0	0	7.3	2	132	.03	.00	0.5	0
	Ave.	50	3	0	1	7.5	-	210	.09	.06	1.0	0
June	Max.	57	4	0	3	7.8	4	234	.16	.20	1.3	0
	Min.	16	1	0	0	7.5	2	182	.02	.00	0.5	0
	Ave.	45	3	0	1	7.5	-	218	.05	.06	1.3	0
July	Max.	54	5	0	4	7.6	4	232	.23	.20	1.5	0
	Min.	35	3	0	0	7.2	2	204	.02	.00	1.0	0
	Ave.	43	4	0	1	7.4	-	219	.06	.00	1.1	0
Aug.	Max.	57	6	0	2	7.6	4	252	.10	.00	1.5	0
	Min.	32	2	0	0	7.0	2	196	.03	.00	0.8	0
	Ave.	40	4	0	.9	7.3	-	253	.05	.00	1.7	0
Sept.	Max.	47	7	0	3	7.5	4	278	.15	.00	2.2	0
	Min.	26	2	0	0	7.0	2	218	.01	.00	1.0	0
	Ave.	40	2	0	.7	7.5	-	247	.05	.01	1.5	0
Oct.	Max.	47	4	0	2	7.7	3	262	.09	.23	1.7	0
	Min.	28	0	0	0	7.4	2	228	.00	.00	1.5	0
	Ave.	47	2	0	1	7.5	-	234	.03	.00	1.5	0
Nov.	Max.	57	3	0	2	7.6	3	244	.08	.00	1.6	0
	Min.	37	1	0	0	7.2	2	220	.00	.00	1.5	0
	Ave.	43	2	0	0	7.6	-	179	.02	.01	1.5	0
Dec.	Max.	52	5	0	2	8.1	3	212	.05	.05	1.7	0
	Min.	33	0	0	0	7.5	2	150	.01	.00	1.2	0

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FIGURE IX

HARDNESS OF TREATED WATER
EASTVALE PLANT
BEAVER FALLS MUNICIPAL AUTHORITY

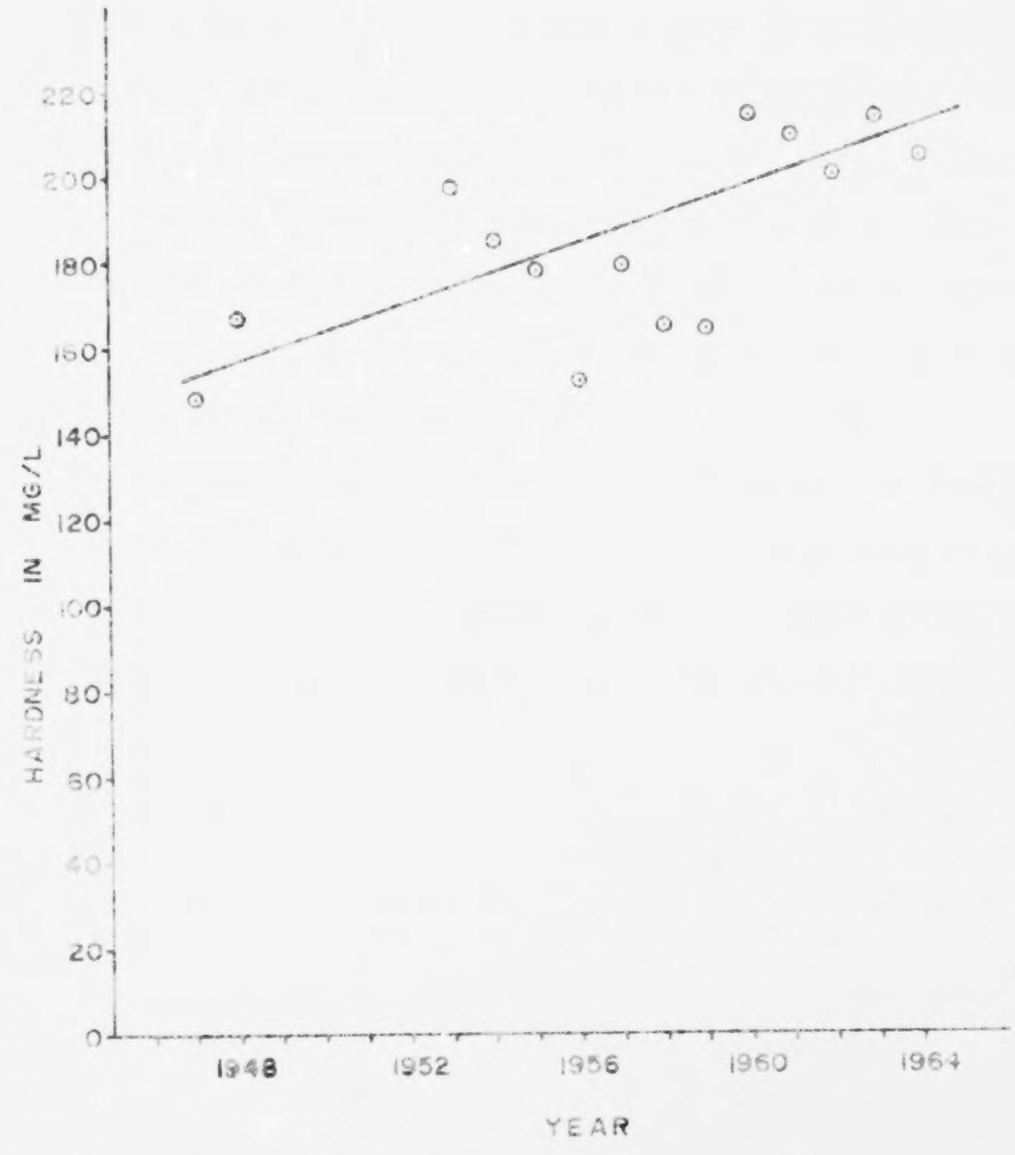

Figure IX. At least part of this increase is the result of pollution resulting from sewage, industrial wastes and other sources.

Hardness affects the consumer. Hard water results in increased use of soaps, synthetic detergents, general household cleansers, scouring compounds, and bleaches. An increase of 25 mg/l of hardness, which is considered to be a conservative estimate of that attributable to pollution, would result in increased purchases of soaps, synthetic detergents, etc., costing about 30 cents per person per year. The total increased cost to the 65,000 users of this water is approximately $20,000 per year.

Other intangible economic damages due to increased hardness of the water include increased fuel consumption due to scaling of boilers and hot water tanks, adverse effects on plumbing, and increased costs of additional treatment required by certain commercial establishments.

CHAIRMAN STEIN: Thank you, Mr. Walton. Are there any comments or questions?

MR. CLEARY: Dr. Walton, page 51, I don't fully understand the implication on the last paragraph up near the top where you say the gross and variable pollution shows that abnormal treating measurements are required, and then just preceding that you mentioned the fluoride concentrations.

Now, you would not consider the fluoride in the word two-tenths to seven-tenths as a gross amount.

MR. WALTON: No, I am not, concerning the fluorides and phenols itself, as particularly gross. I am considering the bacterial requirement and the fluoride requirements, particularly the highly variable chlorine requirements.

MR. CLEARY: Well, the reason I bring it up is the proximity of the two statements. Now, on page 54 -- and this is a question for my enlightenment; Is not part of the hardness increased -- that is, the water served to the consumer -- does not part of this represent an increase that is put in the water by the municipal authorities as the result of the types of treatment they are using; could we attribute part of that?

MR. WALTON: There is no question that the raw hardness in water is increased by the use of aluminum sulfate. Roughly, this increases rather constantly, in most cases running 15 plus or minus something milligrams per liter, depending on the amount of aluminum used.

MR. CLEARY: If that were the case, then the municipal authority is really responsible for an increased cost to the consumer due to soap because they are adding the hardness itself, not to the pollution of the river. Is that a fair conclusion?

MR. WALTON: There is no question that they increase the hardness but this is an essential part of the treatment process just like the use of chlorine is an essential part of the treatment process. You would not have them drink uncoagulated water or undisinfected water.

MR. CLEARY: Thank you very much.

MR. POSTON: Mr. Walton, just a minute. Would you care to comment -- you were at Beaver Falls several times -- would you care to comment on the safety and the attention that this water receives?

MR. WALTON: I think that the management and the individuals involved in the operation of that plant, I bring in the individuals as well as the management because this is a plant that operates 365 days a year, 24 hours a day, the weakest link is the weakest operator and the fact that they have been able to take a water like this, turn out what they have, day in and day out, hour after hour is a very creditable performance.

MR. POSTON: I asked this particularly, Dr. Walton, because I didn't want anybody to feel that we were being critical of the Beaver Falls Water Department in any way but, rather, that we did feel that they have done an excellent job.

MR. WALTON: I think they do an excellent job.

CHAIRMAN STEIN: Are there any further comments or questions?

Mr. Walton, I would like to ask you this for my own information. The 1954-55 study, you conducted that, didn't you?

MR. WALTON: I did.

CHAIRMAN STEIN: Now, as I remember that, that had a certain notoriety in the business of your picking 54 plants that had the most grossly polluted water that they were treating; not to say the water wasn't safe. You checked, as I understand it, the '64 data. Would you still say that the water source of that Eastvale plant still retains its place on the honor roll?

MR. WALTON: It is in the same order of magnitude. I have not tried to place it exactly, fit it in.

CHAIRMAN STEIN: But it is among the top 54. The last time you found that, only 13 places were getting more bacteria measured by coliform and this ranged what, three or four in the amount of chlorine they had to use and some of this ahead of chlorine, just using the water for industrial water supply?

MR. WALTON: Yes.

CHAIRMAN STEIN: And as far as you can tell, in '64 at least, physical conditions have not changed that much?

MR. WALTON: Not appreciably.

CHAIRMAN STEIN: Now, I would like again to see if I can understand that point. You made a point about the variation in the chlorine picture. What is the significance of that that at times you need much more chlorine than others?

MR. WALTON: Regardless of the treatment you give a water supply, it is my opinion that disinfection is your final treatment on top of the filtration, coagulation filtration that permits you to produce a water conforming with acceptable bacteriological requirements for drinking water; without disinfection, you cannot. Adequate disinfection is a must of any water that is polluted at all.

Where you will have a sudden and rapid change in the chlorine demand of a water, it may get to your plant with inadequate disinfection.

Does that answer your question?

CHAIRMAN STEIN: Yes.

MR. CLEARY: Chairman Stein, your question prompts one on my part now, and I am referring Dr. Walter to page 49. You mentioned the coliform bacterial density. I will wait until you get that page. It is the last paragraph in the measure of sewage pollution, and averaged 31,000 per 100 ml. and I presume that's for 1964.

MR. WALTON: That is 1964, correct.

MR. CLEARY: In 1963, was it the same or higher or lower?

MR. WALTON: I did not have time in the preparation of this report to examine all of the records that I have had, and I cannot tell you.

MR. CLEARY: I am in the same position you are. I didn't have a chance to study these thoroughly. My impression is -- and this needs to be corrected -- was that in 1963 it averaged 9,000. I merely bring this up because it seems these yearly averages we are comparing now, 1954 and 1956, which I presume was in the range and magnitude of 30,000.

MR. WALTON: 1953 and '54.

MR. CLEARY: And here we have the year of 1963 and we may have other years, but I think that ' 63 may be in the neighborhood of 9,000, so I merely threw that out. There was a change in yearly averages there which indicates that something happened to give some improvement to the water from the bacterial standpoint.

I want also to add -- and I think you would readily agree with me -- that both of those years, '63 and ' 64, were really abnormal years in terms of dilution. These were drought years. That's a fair statement, isn't it?

MR. WALTON: This again, I didn't have time to study, really.

MR. CLEARY: Thank you very much.

CHAIRMAN STEIN: Mr. Cleary, I would like to -- at least for my own information just in answer to this -- but I would like to make a comment on that. I always considered pollution control, as I pointed out, as having to take care of the critical points at the peak low. If we have a drought year, that is, the people are drinking the water during that year and we have to consider this. I have always been entranced by these averages.

The point is, if swimming water in the beach is bad during 15 days in August, the average may not mean anything all year. If Dr. Walton or anyone else found that in the year of 1964 you could have a particularly bad year, certainly the people in Beaver Falls had to live through that year and rely on the public water supply.

Are there any further comments or questions to Dr. Walton?

MR. POSTON: Graham, do these industrial discharges constitute public health threats to Beaver Falls, Pennsylvania water supply?

MR. WALTON: The only lead I would have from my analysis of the data that I studied, which was basically the operation reports of the Eastvale plant, is this extremely variable chlorine requirement. This is almost certain to be due from some industrial waste sources.

MR. POSTON: I think that's all the questions I have.

CHAIRMAN STEIN: Mr. Poston, do you have any more?

MR. POSTON: We will now hear from Mr. Maurice LeBosquet. He will talk to us about the federal reservoirs and waste treatment.

Mr. LeBosquet.

MR. LeBOSQUET: Conferees, I wish to mention as background that the Public Health Service reports, in justification for the program in Mosquito Creek Reservoir, were prepared under my direction and I have always been interested. I thought, therefore, that the records of this conference should maintain -- should include some details in regard to that experience. This is probably, as the Board mentioned, one of the greatest developed low flow regulation areas in the country. Well, I felt this should be in the record. I really didn't want to become personally involved, but I seem to have.

Mr. Lloyd yesterday probably credited Congressman Michael Kirwan with expediting the construction of these two reservoirs. However, Congressman Kirwan, the Corps of Engineers, and Public Health Service were prodded by local interests and in the source of that pride, I might explain it is Mr. Kenneth Lloyd for whom we worked very pleasantly for many years. There are five specific points I would like to bring out in connection with this aspect of the situation.

One is that the policy relative to adequate treatment as defined in the Act is a general policy used throughout the country. There have been well over 100 reports written in connection with Section 2(b) of PL 660 since the '61 amendments. As a matter of fact, 12 are now in the review stage in Washington at this point. I would like to read various statements of a Review Board we have in Washington that has considered this particular policy question in the course of its normal review of these reports.

It might be explained that as policies go, policies change, and we think of one thing today and somewhat differently tomorrow. But this probably affects the current status. This is a recommendation of the Review Board of the Water Pollution, Water Supply and Pollution Control Division. It is recommended that for purposes of estimating and evaluating storage for regulation of streamflow for the purpose of water quality control, adequate treatment has been defined as at least 85 percent removal of B.O.D. A higher figure may be used when justified.

It's strange that the only disagreement we have had in this regard, 85 percent, is in increase or in decrease. This is from our own field people. There are other aspects of it. For example, the requirement that adequate treatment be provided for should recognize the use and validity of in-plant industrial waste control measures as a means of pollution reduction.

This is only natural because this is one of the most promising and most productive methods that industry has.

I might also explain that the question of what is adequate treatment of hot cooling water has really not been resolved. This will no doubt come in due time when we are confronted with the specific.

I might say that the 85 percent is what we use at the present time; however, we permit industrial people to use higher or lower figures as they see fit as long as they furnish us with an adequate explanation from this more or less standard figure.

The second point is that -- going back a little -- the general concept behind the studies of low flow regulation is that quality control be accomplished primarily by waste treatment. However, in certain places, this is not enough -- and I think this is one situation where that is true -- and flow regulation must be added.

The Bureau of the Budget -- and this I know -- and the Congress -- and this I suspect -- have had the feeling that flow regulation should not be used if treatment can do the job. In practically all the cases, treatment -- within these limits -- is much cheaper. Also, local funds from those responsible for the pollution are involved.

I might say Columbus, Ohio, has a notable example of the limitations we give on waste treatment. Columbus probably has as complete a treatment plant as any place in the country. Not only that, but they have tremendous intercepting sewers which hold overflow from storms and they have storm water tanks. These are measures that are practiced at no other place in this country that I know of. Still, the site of the river needs low flow regulation. Here is a situation where everyting the local people can do is being done, and low flow regulation is needed. This, I think, is a true place for the use of this particular pollution control measure.

The third point. In the case of the Mahoning is another place where both treatment and flow regulation are needed. I might say in this case that the flow regulation came first and the treatment came now or some twenty odd years later. Those of us who attempt to justify this one step toward cleaning up pollution get a little bit discouraged when we have to wait 20 years for the local corporation to be added. In the 1940's, when we studied the Berlin and Mosquito Reservoirs, there was no specific Congressional authorization for this flow regulation. We did it on our own. We tried it and it worked; at least the reservoirs were justified.

I might say that the minimum flow as reported by Mr. Brazon this morning was 28 CFS. And I think there is no question in anybody's mind that this area would be secondary treatment and then that might not be enough. In this suggestion, I would say that the low flow regulation is doing at least part of the job that treatment could be called upon to do.

In the earlier reports of the Public Health Service on the Mahoning Valley and flow regulation, there was, I believe, in one of those reports -- I don't have it here -- a mention of 65 percent degree of treatment. At that time, this prohibition of the current law that it shall not be used as a substitute for treatment was not in effect and we were, in effect, hunting for all the benefits we could get to build these reservoirs, and one of them was to substitute for secondary treatment.

This is no longer permissible but I might explain why you find a 65 percent treatment on the Mahoning River in the Public Health Service report.

I have made a comment about how long it took to get the sewage treatment plant built here in Youngstown. This is slightly critical, if I might say so. I also would, on the other hand, take this occasion to commend the local area because I think this is the first time that I know of that the local people have gone out and sold a bond issue and actually contributed funds towards construction of one of these reservoirs.

The statement is "put your money where your mouth is," and this is one case where the local areas have done just that for which they are to be commended, and I think they stand ready to do the same on future projects.

Now, one thing that bothered me at this meeting and the record is fairly clear. The local people that have spoken may think that the river is plenty good enough. This has been repeated several times, but what concerns me is what happens on the next project? It seems to me it may be a little difficult for those of us who prepare reports on the next project to use as partial basis for justifying this future project the matter of water quality control and this is a substantial part of the justification of some of these reservoirs.

As I say, this will be difficult when the record is so clear that the water is very fine. I think that some of the people that haven't spoken may feel differently.

I also have some feeling that perhaps some of the people that have spoken here may change their mind. I do know that the pressure toward regulation use has been tremendous and it may be a little difficult to resist this pressure, the pressure which the Public Health Service gets all the time, and that is the pressure from the conservationists.

CHAIRMAN STEIN: Thank you, Mr. LeBosquet Are there any comments or questions?

MR. CLEARY: Mr. LeBosquet, I would be pleased if the record would show that the Ohio River Valley Water Sanitation Commission right from its inception had the invaluable professional aid of Mr. LeBosquet in guiding it, and we owe him a debt of gratitude in much counselling in which the interstate activities progressed and I am happy that we might be able to acknowledge that publicly.

I do have another question. Don't run away. If I understand what you just said with respect to the policy on low flow regulation and the definition of adequate treatment, I gathered from your remarks that this still is in a state of evolution and flexibility, and 85 percent is something that is good to aim at, the goal to modify it with respect to local conditions, and what your field men may consider to be an appropriate change. Is that a fair understanding of what you said?

MR. LeBOSQUET: That's what I said and I suspect that this will be in the coming direction as Dr. McCleary studied the Potomac during his years off, and there they are talking about somewhat higher.

It is more economical to put higher treatments than to put in low flow regulation.

MR. CLEARY: Well, of course, I think that is a question where you alluded to where a local regulation may have a determination which we can't see. Now, there is one other matter and I am wondering if a typographical error appeared in your memorandum, and I am looking at Appendix A on page 1. Let's read down to where you quote. It's about halfway down. It says "...the analysis." Do you have that?

CHAIRMAN STEIN: It's the last part of the first paragraph.

MR. CLEARY: "...the analysis indicates a minimum dissolved oxygen content of 3.0 parts per million could be maintained in the river during the summer months with the current flow schedule over the life of the reservoir, provided the organic waste load could be reduced by 85 percent before discharge to the river." That's what was said, and I am asking is it possible there is a typographical error? Our recollection of that report, October, 1956, was that it said 65 percent instead of 85.

MR. LeBOSQUET: No, I looked through a number of those reports. I looked for 85 percent and I found one. I also found a 65 too which I also mentioned.

MR. CLEARY: Unfortunately, I don't have that report with me. I am going to ask my colleague. We thought it may have been a typographical error. I wonder if you will identify it.

MR. LeBOSQUET: There is also 85 percent --

this is the one I quoted. It is more recent, incidentally.

MR. CLEARY: Excuse me, I don't think I understand. Is 85 percent correct in your statement here?

MR. LeBOSQUET: Yes, I think so.

MR. CLEARY: Thank you.

DR. ARNOLD: Considering the degree of treatment that will be provided in the Youngstown-Warren area and considering further that the people in this area did put their money where their mouth is, as you chose to say, and they provided this money or additional storage in the west branch reservoir, what will be the Federal policy in using this water low flow regulation?

MR. LeBOSQUET: Well, I think that reservoir was justified under the old ground rules and I presume that you bought that water and probably have some control over how it is used, but the present ground rules and the present law would not permit this even though you paid for it. It is the way I understand the law.

In other words, it says it shall not be substituted for adequate treatment and it doesn't say unless it is paid for.

MR. COMPSON: That is not a provision of the law, that is an interpretation of the law.

MR. LeBOSQUET: It shall not be used as a substitute to have adequate treatment.

MR. COMPSON: That is correct, but adequate is defined by your service, I presume.

MR. LeBOSQUET: I might say that there is quite a lot of historic legislative shenanigans and discussion with the Bureau of the Budget behind this provision. This provision was proposed to the Bureau of the Budget some years before the Act was actually passed. We have been trying to get in this in our authority for some time. We tried first through the Bureau of the Budget and they were uncooperative. Finally, I came back and found it was in the law, so this is our present authority.

MR. COMPSON: Well, of course, what are adequate regulations in a given situation would certainly depend on the complexity and the problems and certainly the complexity and the problems in this valley are much greater than you will find in the average situation.

MR. LeBOSQUET: I wanted to make it clear that what the Bureau of the Budget feels, and this I know because they reviewed these reports of ours, is that they do not want us to be using low flow regulation for some treatment that can be accomplished -- some correction that can be accomplished for treatment. And perhaps the word"adequate" is unfortunate; it happens to be the one in the law but I know that this is the feeling within the Bureau of the Budget and I think it is the feeling of the Congress.

CHAIRMAN STEIN: Are there any further comments or questions? Mr. LeBosquet, I would like to ask you one for my own clarification.

As I understand it, you talk in terms of 85 percent treatment. You are probably talking in terms of pro-secondary treatment. 65 percent, as I feel, raises a new concept with me to the so-called intermediate treatment and, as I understand it, an extra chemical is added to take some of the solids out. Is that a brief statement?

MR. LeBOSQUET: That is one form of intermediate treatment.

CHAIRMAN STEIN: Is that what they are talking about in this area here for intermediate treatment of the removal?

MR. LeBOSQUET: I think so but I couldn't -- you will have to ask someone else that question.

CHAIRMAN STEIN: Well, if you had any experience with that kind of treatment in other areas of the country where they put these chemicals in or have you heard of it?

MR. LeBOSQUET: Yes, but I don't place great stock in intermediate treatment.

CHAIRMAN STEIN: Would you care to say why?

MR. LeBOSQUET: Because once the plant is built and it is approved and the states and other agencies have gone home, the city fathers discover they could save a lot of money by not buying chemicals. This has been quite common experience.

MR. BOARDMAN: I would like to add something about Pennsylvania. You talked about New Castle's intermediate plant. This plant is one part of sewage and will receive secondary treatment by this process.

MR. LeBOSQUET: I am for this because this will be operated. Chemical treatment is very seldom operated.

CHAIRMAN STEIN: Are there any further comments or questions on Mr. LeBosquet's statement. If not, thank you very much for your contribution.

MR. POSTON: We will now ask Mr. Kittrell again to summarize and make the conclusions.

MR. KITTRELL: Summary and Conclusions. On the basis of reports, surveys, or studies, having reason to believe that pollution from sources of wastes along the Mahoning River in Ohio may be endangering the health or welfare of persons in Pennsylvania, the Secretary of Health, Education, and Welfare called a conference of the States of

Ohio and Pennsylvania, the Ohio River Valley Water Sanitation Commission, and the Department of Health, Education, and Welfare, on interstate pollution of the Mahoning River, to be held in Youngstown, Ohio, on February 16, 1965.

Two. The area covered in this report encompasses the Mahoning River from Warren through Youngstown, Ohio, across the Ohio-Pennsylvania state line to its mouth, the Shenango River from Jamestown, Pennsylvania, to its confluence with the Mahoning to form the Beaver River, and the Beaver from this confluence to Beaver Falls, Pennsylvania.

This area is one of the most highly industrialized in the Nation, with emphasis on the processing of various metallic products. Of these, steel production predominates, with nearly seven per cent of the national capacity in the area.

Three. Water uses revolve largely around industrial needs. Upstream reservoirs, owned or operated by Youngstown, the Mahoning Valley Sanitary District, the State of Pennsylvania, and the Federal Government control flows principally to insure adequate continuous water supplies to industries and municipalities, to lower temperatures of industrially heated streams, and to flush away the wastes of industries and municipalities. It is only near the lower end of the Beaver River that the main stream is used for municipal water supply and for recreation, such as boating, water skiing, and fishing.

Four. Municipalities discharge sewage, most of it after some degree of treatment, to the streams. Most of the towns and cities along the Mahoning and Beaver Rivers provide only primary treatment, which removes between about 30 and 60 percent of the bacteria, oxygen-demanding constituents and suspended solids. Most of those on the Shenango provide secondary treatment, which removes about 95 percent of the pollutional constituents.

The total sewered population is about 467,000. The bacteria are reduced by treatment an estimated 61 percent, leaving bacteria equivalent to those in untreated sewage from about 184,000 persons to reach the streams. About 78 percent of the bacterial load is discharged to the Mahoning River in Ohio, and 22 percent to the Shenango and Beaver Rivers in Pennsylvania. About 71 percent of the oxygen demand is discharged in Ohio and 29 percent in Pennsylvania.

In Ohio attempts to obtain data on industrial wastes from the Ohio Department of Health, ORSANCO, and the plants themselves were unsuccessful, with the exception of a few of the smaller plants that provided information when visited. Ohio law prohibits the Department of Health from releasing information on industrial wastes without permission by the industries. In Pennsylvania, data on industrial wastes in the files of the State Department of Health were made available. Without data on Ohio industries, however, a fair and equitable appraisal of relative contributions to the pollution of the river system cannot be made. A detailed study of the industrial waste streams and the rivers will be necessary to establish relative responsibilities.

Despite this handicap, a general knowledge of locations, types, and sizes of plants, combined with data available from various stream studies and reports, provides an adequate basis to establish that interstate pollution exists and to indicate the areas in which the pollutional materials are discharged.

The metal processing industries, with steel mills predominating, discharge a variety of waste materials that damage water quality and interfere with water uses. The principal industrial area is along the Mahoning River in Ohio, from Warren to Lowellville, just above the state line. A secondary industrial concentration is in the Sharpsville-Sharon area of Pennsylvania on the Shenango River. Other more or less isolated plants are scattered throughout the rest of the watershed.

Industrial waste constituents that damage water quality are oxygen-demanding materials, strong acids, lime or limestone, phenols and other taste-producing materials, iron, manganese, ammonia, cyanides, oil and greases, and suspended solids. Heat in cooling water discharges causes direct damages and intensifies damages by other causes.

Six. The Mahoning River has been abandoned as a source of municipal water supply because of pollution. In the reach from Warren, Ohio, to its mouth in Pennsylvania, it has been rendered unsuitable for this use by bacterial pollution from sewage, and by toxic industrial wastes, such as cyanides and metals, by taste-producing wastes, such as phenols and oils, and by suspended solids, ammonia, iron, manganese, acidity, hardness, and heat, which render the water difficult and expensive to treat or undesirable for consumption and use after treatment. Fluoride concentrations would pose the threat of mottled tooth enamel to children who drank the water.

These effects are modified by dilution by the Shenango River, and by natural purification in the Beaver River, but some of them persist to Beaver Falls, where bacterial pollution, taste and odor, oil, ammonia, iron and manganese have been found to be excessive, and difficult and expensive to control by treatment.

The gross and variable pollution of the Beaver

River at Beaver Falls, Pennsylvania, poses a continuous challenge to those responsible for using this river as a source for production of a safe and palatable municipal water supply. Unusual treatment measures, such as abnormal chlorination and extensive use of chlorine dioxide, potassium permanganate, and activated carbon, are required. Annual chlorine applications, averaging between 8 and 9 milligrams per liter, and a daily application up to 60 mg/1, are among the highest chlorine requirements at water plants in the United States. The occurrence of sudden changes in chlorine requirements in excess of 10 mg/1 requires unusual care to insure production of a safe water. Either human error or equipment failure could result in an unsafe and unpalatable water.

Seven. Tangible economic damages attributed to pollution include $9,000 per year due to increased cost of chemicals used at the two Beaver Falls Municipal Authority's water plants, and $20,000 per year due to increased use of soap, synthetic detergents, and other cleansers by consumers.

Intangible damages attributable to pollution include increased fuel consumption due to scaling of boiler and hot water tanks, adverse effects on plumbing, and increased costs of additional treatment required for water used by certain commercial establishments.

Eight. While the Mahoning River is extensively used as a source of industrial water supply in the reach from Warren to the state line, it cannot be considered a satisfactory source for many industrial uses. Most of the characteristics that render the water unsuitable for municipal uses would interfere with certain types of industrial uses. The specific problems that undoubtedly are encountered in existing industrial uses can be ascertained only from the plants using the water.

Nine. From Warren to its mouth, the Mahoning River is virtually destroyed as a recreational stream. Oil and grease coat its surface and discolor its banks, suspended solids destroy its clarity, sludge covers its bed, and oil clings to tree limbs and bushes. Oxygen-demanding materials, acids, cyanides, ammonia, suspended solids, and sludge depostis, iron and manganese, and heat have practically eliminated its fish, and the aquatic organisms on which they feed. Bacterial pollution renders it hazardous to any who might swim in it, and even to those who might contact its waters incidentally in boating or fishing.

The bacterial hazard and oil film, somewhat reduced, persist in the Beaver River to Beaver Falls. Effects of other materials on fish and aquatic organisms persist in the upper reaches of the Beaver, and conditions improve only as the river approaches Beaver Falls, where aquatic organisms increase and a catchable fish population occurs. It is in this same reach that boating and water skiing are noted, even though some health hazard is involved in such uses.

Ten. Sewage and industrial wastes discharged to the Shenango River in Pennsylvania contribute to some degree to the adverse effects described in the Beaver River. The Shenango below Sharon is covered with an oily film, its aquatic organism and fish population are reduced, and it undoubtedly carries some of the characteristic wastes from metal processing operations that are carried by the Mahoning. In the absence of detailed industrial waste information and more complete stream data, it is not possible to specify the relative contributions of the two streams to the degradation of the Beaver River. The known distribution of industry, and the limited stream data available, however, identify the Mahoning River as a contributor and, in all probability, the major contributor of harmful wastes.

Eleven. Partially treated sewage and industrial wastes discharged to the interstate waters of the Mahoning River in Ohio cause pollution that endangers the health or welfare of persons in Pennsylvania, and therefore are subject to abatement under provisions of the Federal Water

Pollution Control Act, as amended (33 U.S.C. 466 et seq.)

CHAIRMAN STEIN: Thank you Mr. Kittrell. Does that conclude the federal presentation?

MR. POSTON: That concludes the federal presentation.

CHAIRMAN STEIN: We would like to now ask the conferees if they have any questions or comments of any of the Federal participants who prepared presentations, as we agreed to at the beginning.

MR. POSTON: I would like to ask Mr. Kittrell how he might categorize the Mahoning River. Mr. Kittrell has had wide experience throughout the country and opportunity to see most of our streams and actually study them.

Would you care to comment on this,categorize these?

MR. KITTRELL: Well, as Mr. Stein said yesterday, this is a rather difficult comparison between streams. You have on stream where the oxygen is totally depleted; you have another one with the coliform bacteria in the millions. Which would you say is the worst stream? It is almost impossible to compare one to the other. However, I would say that in the 35 years, I probably examined in the neighborhood of 200 stream reaches in connection with pollution studies, and I cannot recall one where there were more pollutional constituents which exceeded generally accepted satisfactory levels of water quality than the Mahoning.

MR. POSTON: Thank you.

MR. WEAKLEY: Mr. Kittrell, I notice from reading this report of the Federal Department of Health, Education, and Welfare, that it was primarily prepared way in advance of this hearing or this conference, and apparently before you had the opportunity to hear a description of the things that have been done in the Mahoning Valley and in recent years and recent months; am I correct in that statement?

MR. KITTRELL: That is correct, we heard of these improvements only yesterday.

MR. WEAKLEY: Now, taking those improvements into account, would you be inclined to change any of the conclusions that you just expressed?

MR. KITTRELL: We have not been provided enough data on the residual wastes that I can make any judgment whatsoever.

MR. WEAKLEY: So that these conclusions that you have just expressed would properly be subject to some revision or amendment if you did have the opportunity to take into account and the more detailed account the improvements that you have heard about yesterday?

MR. KITTRELL: I can only say that there is that possibility. However, without some knowledge of what these improvements actually have accomplished in the way of production and waste loads, I can't answer the question honestly.

MR. POSTON: I would like to ask Mr. Black a question or two. There has been considerable conversation in this report reporting on irregularities in quality in the Beaver Falls area and I wondered whether you might care to outline some of the procedures that should be instituted to prevent these irregularities in water quality.

MR. BLACK: May we think of this in terms of pollutional constituents observed in the river?

MR. POSTON: Yes.

MR. KITTRELL: And answer you on the basis of those.

MR. POSTON: Yes.

MR. BLACK: Permit me to preface this statement then with the thought that any recommendations for improvement will be based on a proven need.

Starting with phenol. We have reached a limit beyond which it appears impossible to improve, based on Mr. McBride's report this morning where he essentially said conditions had been static for the last 10 years.

This holds when the by-product coke plants were closed up; when the concentrated wastes were corralled and all included in the quench water systems and then used to quench coke. This pretty well took care of the by-product coke plant, but when we realize that these phenolic compounds are not all discharged to the air when we quench coke but instead are absorbed, some of them, on the coke and that they do carry over into the blast furnaces and we pick up some of them there. You see, we don't have a closed system for phenol.

Then the question arises, what do we do to reduce phenol? We can hardly expect to treat a volume as large as the blast furnace flue gas wash water, that is a high volume, and the phenol concentration is low. So then we must look for some other means of reducing phenol before we use it to quench the coke.

Well, the first thought that might occur to you would be dephenolize the waste before we quench the coke. That has been done but it is a pretty expensive operation. You are really taking two cuts at it, aren't you? That recommendation would have to be given a very careful study by the steel industry and the state, and I would hope ORSANCO. You might even ask us in to talk with you about it, if you like.

CHAIRMAN STEIN: Is that the only source of phenols, from the quenching material?

MR. BLACK: No, there is another source, Mr. Chairman, and it should be mentioned. In the processing of coal tar, we get phenols and it is somewhat less than what we get from the steel industry but we still do get some phenols from the coal tar processing, and the dephenolization there is a possibility and should be considered along with the other sources.

CHAIRMAN STEIN: In other words, there are two sources.

MR. BLACK: There are two principal sources, as we understand it.

CHAIRMAN STEIN: And you would suggest that dephenolization would be a possibility for reducing phenols for both of these?

MR. BLACK: That is correct.

CHAIRMAN STEIN: Which would be, you suspect, the easier one to get at?

MR. BLACK: The processing from the coal tar would be certainly the most economic because of the volume.

Oil wastes: We don't have to go far in the Mahoning River to see some oil. We have been told yesterday of the systems that are in use and proposals for additional oil separation facilities. It is reasonable to expect that oil separation facilities will be so designed that we can hope for an effluent concentration in the order of what we would expect in an oil refinery. It is a similar type of oil and that's 50 parts per million. We haven't seen effluent data, I don't know how close that is being approached.

There is another source of oil from the mills and that was pointed up yesterday in the hot rolling mills where soluble oil is used. This is a little more difficult in that emulsion will have to be broken usually by acid treatment to drop the pH and then gravity separation. Certainly that would have to be considered along with the oil from the hot rolling mills.

Now, there may be other sources of oil and there undoubtedly are. The ones we have referred to here are significant sources, especially for those mills that have not provided oil separation facilities.

The acid: Spent pickle liquor is probably the most difficult, the most troublesome, shall we say, and there are various ways of getting relief from this waste. Ten years ago at the Mellon Institute ORSANCO put out a very impressive publication on this subject and neutralization was recommended in that publication. It has been publicized all over the world and certainly there are many steel mills today that are neutralizing spent pickle liquor with high calcium lime.

The use of side piles is certainly another desirable and economical way of neutralizing the spent pickle liquor and it is being used in the area, and I understand that neutralization with lime is being used but only with the free acid and that doesn't really do the whole job, does it? Of course, if we start working on the combined acid, I refer to the sulfate that is tied up as an iron salt, then we get some trouble, some sludge. But you might as well get it on your property as in the Mahoning River.

So that I think we would have to consider neutralization, complete neutralization of the spent pickle liquor.

Now, we haven't said anything about the rinse water and that you might hope to dispose of by using the natural alkalinity in the dilution water. Let us hope that that is possible. There are other ways of getting rid of pickle liquor. We were told just this morning, I think, of one steel mill that has drilled a well to put it into the ground. That's another opportunity. This system of neutralization that we are talking about will go far in removing iron as well as the sulfates. True, it will increase the hardness somewhat.

Now, the suspended solids, the inert iron. Here we are thinking of mill scale and the flue dust from the last process and we were shown some pictures yesterday of facilities that have been provided, expensive facilities. We would hope that plant sedimentation could be provided in facilities that would approach 90 percent removal of these inert settleable solids, let's call them suspended solids, because we are dealing with a waste that has both oil and settleable solids. The oil wants to float and the settleable solids will settle. However, with adequate retention, both can be accomplished in the same tank and both are being accomplished; how well, only the operators can tell us.

I am sure those data are available. We have covered four constituents. May we stop there?

MR. POSTON: I think that one thing that causes concern at the water works and concern by the steel people is spills or dumps, tank dumps or tanks, is there any way that this might be handled to minimize this cause of pollution?

MR. BLACK: I am sure there is. If you were operating a water plant downstream, you might seriously consider blocking off sewer connections and providing temporary storage for some of these concentrated wastes that, well, take for instance the one that increased the chlorine demand at Beaver Falls on September 14th last year up to about 60 parts per million; that's almost 500 pounds of chlorine per million gallons. That's a lot more than we use in treating sewage.

so my answer to that would be let's check the sewer connection and where they are located and serve -- and do receive under certain conditions overflow of these concentrated wastes, that these sewer connections be eliminated.

MR. POSTON: Thank you.

CHAIRMAN STEIN: Are there any further questions or comments?

I think the group here, possibly, would like to have you comment on this one further comment. As I understand it, in a technical status and preparing the report, you would ask for the -- this effluent data and attempt to secure it. The sort of presentation of the group here, would you care to comment on the technical status of this effluent data, give your reasons why you think you need it; whether you are satisfied that that would be helpful to you in preparing a report of this kind?

I think we need that to conclude this record.

MR. BLACK: When we limit our interests to the stream alone, we accept a tremendous handicap and anyone who limits their interests to the stream is in the same position. We can take only so many samples from a river and in the data that we are furnished, we were told that these samples represented one gram samples a week, 52 samples a year, and they are gram samples.

Well, we know what we got in those samples but we certainly know what we didn't get and there probably was plenty that we didn't get.

Well, how do we learn more about a pollution control program? There is only one additional bit of data that we need and that's what's coming from the principal sewers. Now, the industrial people make it a practice, most of them and I think in this area as well, to sample, to monitor their own effluents for their own protection, and it is these data that we need to complete the story, to interpret the observations that you make in the stream. It cannot be -- your story is not complete without it.

This is nothing new. This is accepted by most of the states and I might say that I spent almost nine years in Illinois and we wouldn't think of running stream surveys in Illinois without determining pollution loads as a part of the study. And anyone who feels that they can get the whole story from the stream should take a very close look at the value of determining the pollution load at the same time.

And while we are on the subject, I would like to commend the engineering division of the Ohio Department of Health, that small group of engineers are doing an impossible task. They could use three times as many engineers, and if you were to compare that engineering staff with some of the other states, you could confirm what I am saying. They would need backup support, of course, from chemists and biologists.

CHAIRMAN STEIN: Thank you. Are there any further questions or comments? If not, thank you very much.

MR. POSTON: That's all I have.

CHAIRMAN STEIN: I think Mr. Cleary may have some presentation at this time. Mr. Cleary.

MR. CLEARY: Mr. Chairman, our Chairman of ORSANCO, Mr. Bart Holl, said, as he concluded his remarks yesterday, that he reserved the right to have some comments himself or have his staff present what he requested them to do, to look at this report and provide an evaluation. With your consent, Mr. Chairman, we would like to have about 15 minutes and I am going to ask my colleague, Mr. Robert Horton, the assistant director of the Commission, to present these comments.

CHAIRMAN STEIN: Mr. Horton. For those who are here, I would like to give you our tentative schedule now as we see it.

Mr. Horton should be finished about five o'clock, I assume with questioning. At that point we will recess for an hour, reconvene at 6:00 and I hope at that time the conferees will have an announcement to make.

Mr. Horton.

MR. HORTON: Mr. Chairman and conferees. My name is Robert Horton and I am the Assistant Director of the Ohio River Valley Water Sanitation Commission, ORSANCO.

The Chairman of the Commission, Mr. Holl, requested the ORSANCO staff to be prepared to comment on the report on the quality of the interstate waters of the Mahoning River, Ohio-Pennsylvania, which was prepared by the Department of Health, Education, and Welfare, Public Health Service, Region 5, and which was submitted to the conferees as a basis for deliberations at this conference. The staff presumes that the conclusions set forth in the HEW report which must be of greatest concern to the conferees are those that assert the Ohio program of pollution control in the Mahoning River leaves something to be desired with respect to appropriate quality conditions insofar as evaluating health hazards are concerned.

Obviously, the conferees lull away all the viewpoints that will be assembled concerning this matter. Therefore the following observations from a sanitary engineering standpoint with respect to quality objectives and sewage treatment facilities to meet them may be useful.

By way of background, it might first be mentioned that one of the provisions of the Ohio River Valley Sanitation compact to which Ohio and Pennsylvania are signatory parties pledges the states to bring about the treatment of all sewage which flows into waters of the district, at least to a degree sufficient to result in substantially complete removal of settleable solids and removal of not less than four to five percent of the total suspended solids. This is a specific case that can be satisfied by the employment of facilities that provide what is commonly known as primary treatment. The compact recognizes the possibility that under certain circumstances prescribed by local conditions, a higher degree of treatment may be required to attain the desired quality conditions in a stream. In fact, the compact specifically notes that none of its provisions shall be construed as limiting the powers of any signatory state to impose additional conditions or restrictions on the control of wastes discharged in streams within its jurisdiction.

In the case of the Mahoning River pollution control program, the State of Ohio on its own initiative did impose requirements that went beyond the basic obligations specified under the compact. It stipulated that all sewage must be treated to remove at least 65 percent of the biochemical oxygen demand instead of the 35 to 45 percent obtained by primary treatment.

And in addition, the state is requiring disinfection of the treated effluent from sewage plants. In so doing, Ohio was not unmindful of recommendations adopted by ORSANCO on April 4, 1951, when the signatory states agreed on the acceptance of bacterial quality objectives. This action on the part of ORSANCO was intended to resolve uncertainties of practice because in 1951 there were different professional viewpoints as to what constituted an appropriate yardstick for the assessment of the bacterial pollution.

In developing its recommendations, ORSANCO retained bacterial pollution and its relation to health hazards. The ORSANCO objectives were developed as a guide for establishment of treatment requirements for sewage and as a yardstick for evaluating the sanitary conditions of rivers used for potable supplies.

The recommendations of Harold Streitel that were adopted by the ORSANCO states contained the following caution concerning their application, and I quote:

"Methods now available for enumerating bacteria of the coliform group are subject to errors far beyond those of chemical determination or even biochemical tests such as biochemical oxygen demand. This fundamental fact should be kept in mind in interpreting and applying bacterial quality objectives expressed in terms of most probable numbers of coliform in organisms.

"Experience, judgment, and common sense together with a thorough knowledge of local conditions affecting sewage pollution are essential to a rational application of these objectives."

In brief, Colonel Streitel called attention to the fact that when dealing with measurement of coliform organisms, the indication between that and good water did, at the time, rest on whether the number was above or below a certain value such as 5,000 per 100 ml. The objective with respect to river water was stated in this fashion:

> The monthly arithmetical average most probable number of coliform organisms in the river at water intakes should not exceed 5000 per 100 milliliters in any month nor exceed this number in more than 20 percent of the samples of such waters examined during any month nor exceed 20,000 per 100 milliliters in more than five percent of such samples.

The point to be made is this: Application of the objective does not imply that a coliform count in a river in excess of 5,000 endangers public health from the standpoint of using the river as a source of water supply. The decision of Ohio to require a higher degree

ORSANCO recommendations with respect to bacterial quality but stemmed from results of a comprehensive investigation conducted jointly with the Public Health Service.

Thus, the remedial program adopted in 1954 was designed to provide water quality safeguards appropriate for uses of the river with interstate as well as injury to uses in Pennsylvania.

It is the view of the ORSANCO staff, Mr. Chairman, that these facts should form part of the record, not the least of the reasons is this: On page 2 of the HEW report in the section entitled "Summary and Conclusions," it is stated that most of the cities and towns along the Mahoning and Beaver Rivers provide only primary treatment. This is incorrect. Sewage treatment facilities for all of the municipalities in Ohio on the Mahoning are designed to provide at least intermediate treatment, that is, 65 percent B.O.D. removal, and disinfection. Facilities for municipalities on the Mahoning and Beaver Rivers in Pennsylvania, with one exception, are designed to provide primary treatment plus disinfection.

The cost of the incorrect assumption in the HEW report about the degree of treatment provided by Ohio municipalities, the conclusions derived from it cannot be valid, especially those relating to the projection of bacterial conditions at Beaver Falls. The statement in the HEW report is that waste treatment facilities have a capability of reducing the bacterial content of the sewage about 61 percent. However, on the basis of studies published by Kittrell of the Public Health Service, sewage treatment plants operated in accordance with stipulations laid down by the State of Ohio can be expected to remove 90 to 95 percent of the bacterial pollution.

Using this corrected projection of the capabilities of waste treatment facilities, it would appear that bacterial quality in the river at Beaver Falls Waterworks intake would meet the objectives established by ORSANCO. This conclusion is reached on the basis of information in the HEW report regarding the relative distribution of sewage discharges in Ohio and Pennsylvania upstream from Beaver Falls on the basis of existing stream selfpurification characteristics and on the basis of coliform level now prevailing at Beaver Falls.

In the light of this analysis, there is reason to believe that the conferees will want to weigh most carefully the HEW conclusion with regard to endangering public health. Apparently, there is no clinical or epidemiological evidence to support such a contention. At least, there is no data presented in the HEW report relating to water borne illnesses or epidemics at Beaver Falls now or in the past; nor have the commissioners from Pennsylvania or Ohio ever expressed concern on such a matter to ORSANCO.

While on the subject of health aspects of water quality, it appears to the ORSANCO staff that the allusion in the HEW report to fluoride concentrations is irrelevant and misleading. On page 4 of the report, it is stated with respect to conditions in the stretch of the Mahoning River from Warren to the confluence of the Mahoning and Shenango Rivers in Pennsylvania that fluoride concentrations would pose the threat of mottled tooth enamel to children who drank the water. Since this stretch of the river is not used as a source of public water supply, the statement is irrelevant. The only public water supply that may be influenced by conditions in the Mahoning River is that at Beaver Falls located about 25 miles below the state line, but at this place, according to the HEW report on page 39, and I quote, "there is no evidence that the limits"-- and they are referring here to the limit in the drinking water standards -- "There is no evidence that the limit has been exceeded at the Beaver Falls water intake but rather that fluorides have been below the optium lower limit."

In brief, the river water is actually deficient in fluoride. The optium range for prevention of dental caries as represented in the federal drinking water standard is .7 to 1.2 milligrams per liter. Obviously, if the river at Beaver Falls is below the optimum level, there is no threat of mottled teeth. The assessment made by HEW with respect to tangible economic damages at Beaver Falls water plant attributed to existing conditions are not shared by the ORSANCO staff. The report asserts there is an excess expense of $9,000 per year for chemicals used at Beaver Falls for water treatment.

It is difficult to give credence to this conclusion by virtue of the following considerations:

First: The current cost of chemicals for water treatment at Beaver Falls is no higher than the cost at a similar size water plant in New Castle, Pennsylvania, whose supply comes from a different source. And I think it might be worth while to point out these places on the map, Mr. Chairman.

CHAIRMAN STEIN: Mr. Horton, when you get to the map, remember you are speaking for the record, try to explain it so it will appear in the record as to what you are pointing out.

MR. HORTON: Yes, sir. Beaver Falls is down here, as we know --

CHAIRMAN STEIN: Mr. Horton, let me interrupt. I think it would expedite this -- this is precisely the point. When you read "down here" in the record there, I think you might point in the lower right-hand corner of the map, or something of that kind.

MR. HORTON: Well, let me put it this way: The essential point is that New Castle is located on the Shenango River and it takes its water supply from the Shenango which is not affected by the Mahoning River.

Cost for chemicals in 1963 and 1964 at Beaver Falls averaged $11.27 in one year, $12.27 in the other year. Those are dollars for chemicals per million gallons. The costs at New Castle in the same year excluding what was spent for fluoridation at New Castel were $11 even in one year and $12.30 per million gallons in the other year.

And second: The cost of water treatment at Beaver Falls would seem to compare quite favorably with costs at the municipalities throughout the United States. A survey of 697 water utility operations made by the American Water Works Association reveals that the average cost of treating water approximates five cents per thousand gallons.

According to the 1963 annual report of the municipal authority, the cost at Beaver Falls is slightly less than five cents per thousand gallons.

The HEW report also asserts that the hardness of the river water results in estimated monetary damages of $20,000 a year because of increased use of soap, detergents, and other cleansers by consumers. It is a fact that industrial waste discharges to the Mahoning River do contribute to the hardness constituents in the river. However, the water at Beaver Falls can hardly be considered excessively hard in comparison with surface waters in other parts of the Mahoning River basin that are not affected by industrial discharges.

Average hardness at Beaver Falls in 1964 was 184 milligrams per liter. There are many tributaries of the Mahoning River unaffected by the industrial discharges in the range of 200 to 300 milligrams per liter.

The preceding discussion on monetary damages invites comment on the broad economic aspects of maintaining various degrees of water cleanliness.

The HEW report cites the lack of recreational opportunity on the Mahoning River. This indeed is the case and not the least of the reason is that for miles of its length, the banks of the river are lined in continuous array with industrial facilities.

In brief, the locality is hardly one to attract seekers of recreation. This is a work shop area. Notwithstanding this fact, the municipalities have spent over $22 million to free the river from raw sewage and equally substantial investments have been made by industries to keep wastes out of the stream as we have learned from earlier testimony of Ohio and industrial representatives.

Thus, from the standpoint of upgrading water quality conditions, vast strides forward have been taken by the people to rid their streams of obnoxious characteristics. It would be a misconception, however, to suggest that even this great expenditure for the elimination of pollution holds promise of adapting the industrialized section of the Mahoning River to the category of a recreational stream. Among other things, the water is too warm for many species of fish. The banks of the stream are occupied by industrial developments. The channel is obstructed by tanks and access to the river is curtailed. This does not imply, however, that the citizens of the Mahoning Valley do not have it within their power to do what they will with their river. However, in pondering decisions, they should be informed regarding the price tag attached to various degrees of cleanliness.

As pointed out by the State of Ohio, the citizens have already taxed themselves to the extent of $100 per capita for cleaning up the Mahoning and this does not include what the corporate and industrial citizens have invested in stream cleanup.

Therefore, when the conferees deliberate on questions relating to recreational aspects associated with the Mahoning River, the ORSANCO staff respectfully suggests that a judgment on this matter not only invites consideration of the views of the citizens who must bear the burden of expense, but economic study as well to eliminate the cost and benefits associated with alternative decisions.

Mr. Chairman, this concludes our statement.

Mr. Chairman, this concludes our statement, but as a final note, we would like to point out that in addition to the matters just covered, there are some items in the HEW report that appear to be inaccurate or at least that is subject to differences of interpretation. These are minor matters and since they are so minor, we believe it not worth while to bother the conferees with details at this time, and if you approve, we will submit an account of these items for inclusion in the record.

CHAIRMAN STEIN: Without objection, that will be done.

MR. HORTON: Fine. And one more thing. I have with me of our staff Robert Boes, David Dunsmore, and William Klein who will assist in answering questions if there are any.

Thank you.

CHAIRMAN STEIN: Thank you. I don't know if there are any questions. Maybe I am confused but I listened to Mr. Doolittle's thesis that we should be concerned only when it comes across the state line and not concerned with the sources. Now, you talk about this primary treatment plant. As I understand, Mr. Kittrell's estimate of those bugs at the water intake at the Beaver Falls plant is based on measurements there.

MR. HORTON: But the report allows for 61 percent as it was corrected just a little while ago. But the published -- the published research work indicates that intermediate treatment with disinfection will achieve a 90 to 95 percent reduction in the coliform organisms.

CHAIRMAN STEIN: Not all year.

MR. HORTON: Well, I understand it will.

CHAIRMAN STEIN: They are just going to disinfect in the summer.

MR. HORTON: It is my understanding it is continuous but I can't answer that. Ohio will have to answer that question.

CHAIRMAN STEIN: All right, we can talk about that.

MR. CLEARY: I would like to know, Mr. Chairman, what is the situation?

CHAIRMAN STEIN: I don't know.

MR. CLEARY: Well, let's ask.

CHAIRMAN STEIN: I have asked several times.

MR. EAGLE: The situation is that these facilities are provided and the figure we are talking about, Mr. Stein, is that he said capabilities of 61 percent

We claim that the capability is 90 percent or better because they are provided with intermediate treatment and chlorination facilities. Now, these facilities have not been employed as yet. These chemical treatments and chlorination has not been employed as yet because -- and it will be sort of useless if they are dumping in raw sewage in Youngstown -- these facilities will not be completed until the summer and when they are completed, all of the plants will be providing intermediate treatment and chlorination when conditions require in order to meet the water quality objectives at Beaver Falls.

CHAIRMAN STEIN: In other words, not routinely, as far as you can say, as I understand it. They are not going to routinely chlorinate 365 days a year.

MR. EAGLE: The criteria is meeting the drinking water standards at the Beaver Falls water works.

CHAIRMAN STEIN: You mean when the water gets back, they are going to send a message up and you are going to start putting chlorine up around Youngstown. Dr. Cleary, I have asked this question several times, I think the answer -- I don't want to pursue this. This is a conference.

I wonder if we could, to expedite this -- and

I am thinking in terms of time -- do you have any specific points you want to make, Mr. Kittrell, since most of this dealt with your statement, or not?

MR. KITTRELL: No, I don't think I have any particular comment except that I did not have the information on intermediate treatment and the chlorination provisions at these plants. We failed to obtain that for some reason, I don't know why. But the inclusion that you pointed out regarding health hazard was based on actual observations at the Beaver Falls water plant intake.

CHAIRMAN STEIN: Does anyone have any comments or questions on Mr. Horton's statement or not? If not, we will recess until 6:00 o'clock at which time we will reconvene.

Thank you.

(Recess had.)

CHAIRMAN STEIN: May we reconvene. We are going to call on Mr. Boardman first of Pennsylvania.

MR. BOARDMAN: You will find, after Mr. Stein's statement, that my remarks might have a little more bearing but we are requesting that the record of this conference be held over for two weeks so that Dr. Wilbar may have an opportunity to submit a statement in writing.

CHAIRMAN STEIN: Thank you. Without objection, the record will be held open.

Mr. Poston, do you care to make a statement.

MR. POSTON: I have come to some conclusions in my mind which would satisfy me as far as a summary of this conference is concerned. I would like to read them to you.

Cognizance is taking significant progress in pollution abatement in the Mahoning basin. Further water resource development is needed to assure full range of beneficial uses of the Mahoning River. Pollution of waters of the Mahoning River damage water uses in Pennsylvania and endanger the health or welfare of persons in Pennsylvania.

Pollution of the Mahoning is due to both municipal and industrial waste from Ohio. Principal wastes include acids, phenol, oil, solids, tars and heat. Bacteria and oxygen-consuming compounds are the main municipal wastes.

Things that need to be done include: Immediate chlorination of all municipal sewage shall be practiced throughout the full year. The full capacity of municipal waste treatment plants shall be utilized the year round, starting immediately. Plants such as Warren, where the city awaits the order to go ahead with full treatment by their existing plan, should do so.

Item C: Secondary treatment of all municipal wastes shall be accomplished within three years. Six months of development for preliminary plants, 12 months period -- up to 12 months -- for completion of financing; 18 months for development of the final plans; and 36 months for completion.

Item D: Industrial effluents shall be monitored and sampled daily, analysis to include all significant pollutants found in the raw waste. Industrial waste treatment shall be provided to essentially remove all oil, eliminate the discharge of toxic waste, and to eliminate acid discharges.

Item F: River water quality characteristics shall be maintained by providing of municipal and industrial wastes treatment to meet the water quality objectives of the report of the water pollution study of the Mahoning River basin by the Ohio Department of Health; that is, the report of 1954.

That's a completion of my summary, Mr. Stein.

CHAIRMAN STEIN: May we call on ORSANCO?

MR. WEAKLEY: Mr. Chairman, as the spokesman for the conferees representing ORSANCO, I wish to say first of all that we do not share the views that have been expressed by Mr. Poston and we request that the record be held open for an additional two weeks for us to be given a little bit more fully the statements that have been made here and, at that time, submit our complete view.

CHAIRMAN STEIN: I think this will be done. May I suggest either you send your remarks to me or if you don't, send them to the secretary, that you send the copy of your remarks to me so we can expedite getting these in the record.

MR. WEAKLEY: We will send our drafts to you with sufficient copies so that you can submit them to the recorder.

CHAIRMAN STEIN: Thank you, sir. May we call on Ohio?

DR. ARNOLD: Ohio also appreciates the fact that you will keep the record open for the next two weeks so that we too may study the findings of this report a little more closely and present to the Secretary our reaction to this conference.

CHAIRMAN STEIN: Thank you, sir. This concludes the statements.

MR. ARNOLD: Ohio would like to have a written copy of Mr. Poston's remarks that he has just made and we would appreciate receiving them very soon.

MR. POSTON: Maybe I can get a Xerox of them tonight.

CHAIRMAN STEIN: May we go off the record for a moment?

(Discussion off the record.)

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CHAIRMAN STEIN: On the record.

MR. COMPSON: I cannot resist the temptation, sir, that Mr. Poston's romarks were framed as a summary. The way I listened to them they sounded as if they were orders and I would like to know whether these are a summary of the conference or orders issued as a result of the conference.

CHAIRMAN STEIN: The summary, as prepared by the Secretary, contained, I would hope, as the statute requires, the review of all the conferees. The conferees are not empowered to issue orders or make findings. We have not had evidence under oath. We have not had cross-examination and this is a conference, and as a reading of the statute will indicate, no orders are given.

If there is nothing else, I have every hope that every one of these conferences brings us nearer to a solution of our pollution problem and I hope this one did. At least, it gave me an opportunity of seeing such old and dear friends as Jack Kenney again, and I for one enjoyed it and we will stand adjourned.

(Whereupon, at 6:30 o'clock p.m., the conference in the above-entitled matter was adjourned.)

LEAGUE OF OHIO SPORTSMEN

SAVE AND RESTORE WILDLIFE

REPORT

OF

POLLUTION COMMITTEE

* * *

COLUMBUS, OHIO

January 25, 26, 27, 1963

CONSERVE OUR NATURAL RESOURCES

POLLUTION REPORT INTRODUCTORY

"WATER -- OUR BASIC NEED"

The people of the state of Ohio must still face the problem of taking a look at where we are, and where we are going, in pollution control. The constantly increasing need for water for all purposes demands that a searching look be given to what has been accomplished in the past and what will be needed in the future.

If we are to have unpolluted waters for recreation, clean waters for industry, and potable waters for human consumption, the demand will be for all of us to see that pollution is abated and that watershed projects are inaugurated to store and conserve the run off.

Statistics tell us that an average of 4300 billion gallons of rain, fall each day in the United States. Most of this is dissipated by evaporation, by run off into the oceans, and by water uses of plants and animals. At present, only 315 billion gallons a day are available for mans use. Of an average of 30 inches of rainfall in the United States, only about two inches are at present available to man on a dependable year around basis.

At the present time, industry uses the most water. It is currently using 160 billion gallons of water a day in its production processes including the steam generation of electric power for the nations industrial machines. However, twenty years from now, industry will be demanding close to 400 billion gallons of water a day to keep its production facilities going. This is not only because production will increase, but because of the newest technologies-- petrochemistry for example -- are also those which will demand larger and larger amounts of water.

It takes 770 gallons of water to refine a barrel (42 gallons) of petroleum; 50,000 gallons to test an airplane engine; 65,000 gallons to produce a ton of steel or a ton of paper; 200,000 gallons to make a ton of viscose rayon; 320,000 gallons to produce a ton of aluminum; and 600,000 gallons to make a ton of synthetic rubber. These are just a few of the demands of industry for usable water.

"NEED FOR CONSERVANCY"

From these facts it becomes quite evident that we cannot afford to throw water away after we have used it. It isn't like a paper bag or a tin can. Nature has been fairly generous with Ohio and given us an average yearly rainfall of 38 inches. That is all we can expect, and we fell shy of the average in 1962 with only 32.64 inches. As a result many of you know of the shortages we suffered and of the failing wells, drained down lakes and low rivers.

When our rainfall is a normal 38 inches, only 13 inches gets into our lakes and rivers; the balance goes into the soil or is evaporated.

"PERSONAL USES"

Most people do not realize that we have a limited amount of water in Ohio that can be ascribed to personal use. An individual uses about 100 gallons a day and the majority of Ohio citizens have never been without sufficient usable water for personal use, so the water supply problem, and the water pollution problem, do not seem important to most of us. We just take for granted that we will always have plenty of water for our bath, our sewage, washing our clothes and our dishes, and watering our lawns and gardens.

The average individual does not realize the value of a necessary commodity he uses daily, until he finds himself without it, or without as much as he would like to use. Should he be deprived of his allotted 100 gallons, or even half that amount, odds could be layed that he would immediately go into a self-propelled orbit and condemn, malign, vilify, debase, discredit, sully, derogate, slur, defame, stigmatize and deride every public official from the President and the Governor down to the lowest village official for their complete and utter carelessness, neglect, laxity, default, indolence, dereliction and incompetence because they did not have water enough for their daily ablutions and their morning pot of coffee. Such would be human nature, yet if each would give a bit of thought to civic affairs and aid and assist their public officials to secure sufficient facilities for pollution control, and, if necessary, impound and store water vital to the use of the community, clean water for the bath and the morning coffee would be guaranteed.

But we must not forget there is not enough "new" water to meet all our water needs. Water must be used which has been used before in the water systems of upstream cities and industries. At certain times of the year, water is taken from the Ohio River, used, and dumped back again on an average of almost 4 times during its 1000 mile course from Pennsylvania to the Mississippi.

As a present illustration of what we mean by using water over again: the water in the Mahoning River, which flows through Newton Falls, Warren, Niles, Girard, Youngstown, Struthers, Lowellville, and past all the industries on that river, is estimated to be used ten (10) times over again during low flow.

"ADDED WATER SUPPLY AND MULTIPLE USE"

Ohio and Ohioans are beginning to see the light and realize the need of added water facilities. New conservancy districts have been formed, or are in the process of being formed, on many watersheds of the state. Much added interest and study is now being given to "small watershed projects", which can become a community effort of great benefit.

Ohio is the number one user of self-supplied industrial water in all the states of the nation. However, with the exception of Lake Erie, it is the 46th among all the states in surface acres of impounded waters within the state. The average relationship of persons to acres of impounded water for the United States as a whole is 5.4 persons per acre. In Ohio, the relationship is 91 persons per acre of impoundment.

Of the 26,400,000 acres in Ohio, 1.8% only is in the public ownership...The state of Pennsylvania has 11.8%, and the state of New York 11.4% of its land owned by the state or federal agencies, and open to public use. It is high time that the people of Ohio look forward to their needs of more impounded water for flood control, water needs, pollution control and recreation, for Ohio's population density is increasing rapidly.

"THE OHIO RIVER"

The Ohio River was tediously born at the inching pace of glaciers; its genesis took perhaps 100,000 years. Mans work was swifter...In less than two centuries, he turned pure water to foul. Then in a single decade of penance, he made it wholesome again...This event will interrupt no news cast. The rebirth of the Ohio lacks the drama of a disasterous flood, but as a geographic melodrama, it ranks as a major achievement for the central United States.

In 1948, the federal government established the Ohio River Valley Sanitation District. Subsequently, the eight states serviced by the Ohio River signed a compact to control the pollution problem. Ohio's pollution control law became effective in 1951. Thus the Ohio River Sanitary Commission, or ORSANCO, came into being and started on the stupendous task of pollution control of hundreds of municipalities, and upwards to 1800 industrial plants discharging effluent directly into the river or its tributaries; the administration of the huge task and the appropriation of the vast sums of money needed.

In the few short years, municipal plants servicing 1144 communities in size and cost from Pittsburgh's $100 million plant to village installations o $37,000 have been installed. A total of 1557 industries, some of them the largest of their type in the world, have completed installation of their waste control facilities. More than $1 billion has been expended to date. An area in which more than 8 million people live has now been approximately 90% serviced, both municipalities and industries, by water pollution control in many forms. Last year brought the coal mining industry into the picture after years of study. Our hats are off to ORSANCO for having accomplished 90% of a colossal task in so short a time.

More is yet to be done before all the noxious effluent now discharged into the river is made clean. Constant check of the effluent from operating treatment plants must be made as industry finds additional chemicals for use in their manufacturing process that do not lend themselves to present methods of treatment and new methods must be found.

This is particularly true in the municipal discharges where new detergents have caused considerable trouble. The detergent manufacturers are presently working on their product to solve methods and means of removal of the noxious and foaming element.

"OHIO'S PROGRESS"

Who would have believed in 1951 that the municipalities and industries of Ohio would have invested over $700 million in 11 years toward the cleaning of our waters. Our highest praise to the Pollution

Control Board; the Division of Sanitary Engineering; and the Municipalities and Industries of Ohio.

All but two of the 193 cities in Ohio have sewage treatment plants operating or under construction. These two have them in the planning stage. Of the villages, 185 have treatment plants, 44 are using facilities of nearby cities, and about 50 more still need treatment plants.

Of the 13,000 industries in Ohio, the great majority use municipal sewage treatment plants. Of the 572 industries, 98% in Ohio which discharge wastes directly into streams, have provided some treatment...77% of which are considered adequate. These problems are gradually being corrected. Some few are in need of more research.

"THE LAKE ERIE PROBLEM"

The committee is unable to make a positive analysis of this important water facility as detailed reports on the Lake Erie limnology and the effects of pollution on fish propagation, are not available at the time of the writing of this report. When the final reports of the several agencies studying the situation are in, the troubles will be known and steps taken to abate and rectify.

Presently the U.S. Public Health Service, with a branch office staffed by 50 persons will be in operation in 1963...A 114 foot research ship, "Inland Sea," is being outfitted by the University of Michigan Great Lakes Research Division, with a grant from the National Science Foundation.

In addition, the Ohio Department of Health, the Ohio Department of Natural Resources, and the U.S. Department of Interior will conduct studies.

Following are some quotes from specialists in the field giving their views on the problem:

JOHN J. WIRTZ, **Superintendent**
Easterly Water Pollution Control Plant
Cleveland

> *"The south shore of Lake Erie will, in the future, be given a more intensive form of supervision than now provided by the Department of Health. We can consider and anticipate a similar set-up in the State cooperation on the Great Lakes patterned after ORSANCO."*
>
> *"The 'no sewer no water' rule has been put into effect in Cuyahoga County. The privilege or right to surplus water, now carries the obligation not to pollute."*

GEORGE EAGLE, **Chief**
Division of Sanitary Engineering
Ohio Department of Health

> *"1. A lot has been done toward the abatement of pollution.*
> *2. A lot is being done toward the further abatement of pollution.*
> *3. A lot more needs to be done before everybody is satisfied that pollution control is adequate.*
>
> *If any one of these three factors are left out it might lead to unintentional distortion.*
>
> *You can compare the pollution control problem with preventive medicines. Formerly, something had to be wrong with you before the doctor concerned himself about your welfare. Now we have periodic physical examinations and shots to safeguard ourselves against diseases and many other forms of inspection and regulations to prevent disease.*
>
> *We are beginning to think, and to some extent, act in terms of preventive pollution control.*
>
> *We do not have a complete public awareness for the need of pollution abatement and a willingness to pay for the necessary facilities.*
>
> *Water can and must be used over and over again. Our water cycle includes sanitary sewers, storm sewers, and waste treatment plants. Our rivers and lakes of the future will carry more and more used water."*

DR. W. F. CARBINE, **Regional Director**
U. S. Fish and Wildlife Service
Bureau of Commercial Fisheries

> *"Lake Erie is a repeatedly changing lake."*
>
> *"Biological changes are becoming very severe."*
>
> *"The population increase, industrial expansion, agricultural processes, and vast quantities of soil washing into our lakes every year are evidence of these facts. The effluent of sewage disposal plants contain a lot of nutrients. The biological oxygen demand (BOD) of this water is very low. The enriched water increases plant growth--when they die and fall to the bottom they create a high BOD. This has caused vast areas of Lake Erie to be very low in oxygen.*
>
> *The outlook is that that condition will become much worse before it gets better. We cannot predict what might happen to the Lake. One of the most troublesome areas is the Detroit River."*

In a recent report from Dr. Carbine, he said, in substance, that there is evidence that the walleye population in Lake Erie is increasing.

GEN. HERBERT B. EAGON, **Director**
Ohio Department of Natural Resources

> *"We can agree that Lake Erie is a changing lake. It has been changing since the glacial period and it will continue to change."*
>
> *The U.S. Geological Survey as to the production of walleyes in Lake Erie for a period of about 20 years after 1915, indicates that the commercial tonage of walleyes taken was about the same as it was in 1961. In the middle 50's there was a tremendous build-up until 1956, the peak year of walleye production. Then there was a sharp decline. There is reason for concern."*
>
> *It is not quite a painted picture to quote the figures of 1956 as against today's figures, and ignore the figures back as far as 1915.*

> *Commercial landings of fish at Ohio Lake Erie ports for September, 1962, were more than double those for the same month in 1961. The Yellow perch led with 828,775 pounds...much higher than 1961. The Walleye catch was 20,990 pounds...almost double the September, 1961 take of 11,954 pounds. However, the total season's catch of 1962 was below that of 1961. This indicates an improvement, with possibly a better year in 1963."*

***ROBERT J. DRAKE*, Feature Writer**
Cleveland Plain Dealer

> *"We had better come to terms with what is left to us of the resources of nature.*
>
> *The technical people are failing to get their message to the public.*
>
> *We who live along the shores of Lake Erie are about where Cincinnati was in its thinking in the 1930's that led to ORSANCO.*
>
> *The biologists and limnologists can argue whether Lake Erie is dying or only changing. When a lake is rendered unfit for the legitimate purposes people want to use it for, if it is not dying, it might as well be. What we are seeing in Lake Erie from all capable testimony, is a telescoping into a few decades of a natural process that might be expected over a matter of 50,000 years.*
>
> *Like old cities, Cleveland has a combined storm and sanitary sewer system which feeds raw sewage into the Lake through 388 emergency over-flows. A hazy guess is that it might cost $300 million to install separate sanitary sewerage.*
>
> *We must expose our children to an elementary appreciation of conservation of irreplaceable natural resources. They can learn in grade school that water is more than turning on the tap. They will be the young adults of the immediate future with twice our water problems and perhaps they will be more ready than our generation has been to vote for the right answers."*

***EDWARD J. CLEARY*, Director-Chief Engineer**
Ohio River Valley Sanitation Commission

> *"The national pollution problem is nothing more than a series of local problems."*

Mr. Cleary suggested that the *"nut and bolt aspect"* of the control of water pollution resolves itself into the solution of local problems by local groups. When complaints arise as to pollution problems in local areas, committees should be formed of local people, citizens non-profession, non-political, where the *"nut and bolt"* expression comes in; that they get all facts and data; draw conclusions, and chart a course of action and stick to it.

He emphasized that respect is earned; it is not inherited because you happen to belong to some sportsmen group. We don't need any more laws on preventive pollution; but we do need more aggressive enforcement of existing laws. We are not handicapped by technical knowledge, but public agencies are under-manned, and they need the support of the citizens' groups.

The Ohio Water Pollution Control Board ordered Cleveland to place under construction before February 1, 1963, one-half of the remaining projects for cleaning up the lower reaches of the Cuyahoga River...about a $7 million project. A public meeting December 7, in Cleveland, and the formation of the "Lake Front Action Committee" shows progress in the solution of the Cleveland problem.

"POLLUTION AFFECTING WILDLIFE"

The Division of Wildlife has entered into an agreement with the Division of Sanitary Engineering by which the engineers will provide the consulting service, and chemists on water problems involving fish propagation, use of chemicals for various purposes such as weed control, field analytical procedures, and cooperate on investigations of pollution caused fish kills, and many other laboratory services and consulting services relating to water pollution problems.

The field personnel of the Wildlife Division, however, must make the preliminary investigations and report in all instances which causes fish kills or otherwise affects aquatic life and wildlife.

We again remind all our members to immediately report any fish kills or other wildlife kills from water pollution to your local game protector and do everything possible to help him obtain the evidence necessary to prosecute such polluters.

In 1962, a total of 90 instances of pollution were investigated by wildlife personnel. Of these, 62 resulted in fish kills, 56 of which represented only a small part of the population, but 9 represented complete kills.

One of the largest kills took place on Ten Mile Creek in Lucas County. The source of the pollution could not be ascertained, but thousands of fish were lost. Another of the largest was in Cuck Creek, Washington County, where 6976 of the 7326 fish killed were minnows.

A claim of $944.43 for fish killed in the Olentangy River in Franklin County was presented to the offender in July and paid in August. A claim for $1,090.08 has been presented to one city for fish losses when raw sewage was bypassed around the disposal plant. Settlement has not yet been made.

One claim for $1,446.79 was certified to the Attorney General's office for collection.

Again several of the instances of pollution were due to periods of repair or break downs in sewage disposal operations. Exceptional heavy loads during canning operations also continued to be a problem. Combination sanitary and storm sewers were a problem during periods of heavy rain. Breaks in oil pipe lines have increased in number but are one type of pollution which is abated immediately.

A breakdown of the causes of pollution instances in 1962 is as follows:

SOURCE	TOTAL	FISH KILL	HABITAT DAMAGE ONLY
Unknown	24	20	4
Sanitary wastes	22	15	7
Industrial wastes	14	9	5
Oil wastes	11	7	4

Natural causes	6	6	0
Acid water	4	1	3
Duck farm wastes	3	2	1
Gravel washings	3	0	3
Agr. sprays	2	1	0
Water plant wastes	1	1	0
	90	62	28

"CONCLUSION"

Policing

We know that everybody does not obey the law all the time. The next step in maintaining pollution control is the monitoring of all 18 of Ohio's Watersheds. The Health Department has entered into a cooperative monitoring program with the U.S. Geological Survey and the Miami Conservancy District. ORSANCO has developed an automatic monitoring device which may eventually be an auxiliary policeman available for use on all our streams.

The Challenge

The Challenge is given to all outdoorsmen to inform your own community of Ohio's vital need for more impounded water and the fast growing necessity of keeping the waters of our rivers and lakes clean so that the water can be used over and over again. The demand for clean usable water is growing faster than the present supply. The future of Ohio's most valuable asset -- clean water -- depends upon each one of you. Learn the facts. Tell the story.

Projects For Your Club

There are 2.6 million tons of top soil being washed into Lake Erie each year. Why not organize units to explore this waste of top soil and this unnecessary pollution of Lake Erie? Nothing much will be done unless you do it!

Avail yourselves of the League's Pollution picture-tape program and use it.

The committee is greatly indebted to the men who are quoted and to the following agencies for much of the factual data contained in this report:

The Ohio River Valley Sanitation Commission; the Ohio Water Pollution Control Board; Division of Sanitary Engineering; Ohio Department of Health; Ohio Division of Wildlife and the Journal of the Water Pollution Control Federation.

Respectfully submitted
W. *Harold* Yost, Chairman
Pollution Control Committee
League of Ohio Sportsmen

– IMPORTANT NOTICE TO ALL CLUBS –

The League of Ohio Sportsmen, through the cooperation of the State Health Department, is preparing a series of colored slides made from cartoon caricatures, depicting the evils and control of water pollution.

The slides will be accompanied by a tape narrating the slides, the showing time 25 to 30 minutes.

This project of the League will provide every member club a worthwhile project providing they avail themselves of the opportunity. Each member club should purchase one of these kits, form a publicity committee, and cover their community thoroughly with the information furnished...Civic groups, schools, women's clubs, and non-member organizations should all be shown these pictures... It will be a worthwhile project for any club, and really one which all conservation clubs in the state should actively use in their communities.

By ordering slides and tapes in quantity, we hope to reduce the cost of the kit containing both slides and tape to approximately $5.00. If you belong to a progressive club wishing to do a community service, place your order NOW, as we would like to complete the printing and make the copies all at one time.

Address order to League office, M-72, Neil House, Columbus, or inquire at registration desk.

THE POLLUTION COMMITTEE

A Brief History of
THE LEAGUE OF OHIO SPORTSMEN

The League of Ohio Sportsmen is a non-profit federation of the united hunting and fishing clubs of Ohio. It is dedicated to the restoration and conservation of wildlife in our fields, woods and waters; to the abatement of stream pollution; to the rehabilitation and reforestration of unproductive lands; to further conservation education in our schools and the public; and to defend the legal set-up of the Ohio Department of Natural Resources from political exploitation.

The League was organized in 1908 by a group of far-seeing sportsmen to save the remnants of the fast disappearing natural resources of the state. The constructive program of these pioneers was so appealing to the numerous "fish and game" clubs throughout the state that its membership soon reached several thousands. In 1912, the League was chartered by the State of Ohio.

In Union There is Strength

Early in 1913 the combined forces of big and little clubs found that in the League they had a powerful voice in the State Legislature, willing, able and determined to fight for constructive outdoors legislation. Solely through the efforts of the League was the Hunter's License Law enacted, and only after the fiercest opposition which had battled such legislation year after year.

In 1918-19 the League assisted in the re-codification of the game laws. In 1928, a law was passed which prevents the unused sportsmen's license money fron being diverted to purposes other than the propagation, preservation and protection of fish and game.

Since its inception the League pressed for the enactment of a fishing license law to improve fishing through additional revenue. Time after time such a law was introduced in the Legislature and each time it was blocked or defeated. Once it was vetoed after passage. Finally, in 1925, a "rod and reel" license law was enacted. This law penalized the fisherman who used such equipment. Not satisfied with the "rod and reel" law, the League intensified its efforts, to making fishing licenses necessary for all. Later, through League efforts, a Universal Fishing Law was enacted by which all fishermen over 18 were required to purchase a license.

From "Hunting and Fishing" to "Constructive Conservation."

In 1929, the State of Ohio became truly "conservation minded," when the League of Ohio Sportsmen promoted and had passed in the Legislature a 67-page conservation bill. This word "conservation", little understood and heretofore seldom used, was forcibly brought to the eyes and minds of Ohio's citizens for the first time. It brought enthusiastic support from citizens who cared little or nothing for simple "fish and game" laws but were concerned with the preservation of wildlife in all its phases, as well as wise use of the soil. This conservation bill set up the Division of Conservation and Natural Resources and brought into existence the first Conservation Council. This law was amended in 1939, giving the Council authority to promulgate rules and regulations, and the control of seasons and bag limits on fish and game. Later, through League efforts, the Department of Natural Resources was created and the Fish and Game Division was removed from that department and became the Wildlife Division of the new Department of Natural Resources.

Throughout the life of the League it has consistently fought for good outdoors legislation and vigorously opposed that which was bad. It has fought to keep conservation out of politics, it saw that the Hunters Identification Law was enacted, and the League initiated legislation making possible the Ohio Conservation Bulletin.

Sportsmen's Money Protected by Law

As early as 1928, the League obtained promises from both political parties that license money for the Division of Conservation must not be diverted to any other branch of government as it had been. This was enacted later into a law.

In 1939, the League was responsible for outlawing the sale of wild rabbits in Ohio--rabbits which had formerly been killed by thousands and, by any method, and sold on the open market.

In 1940, the League played a major part in the negotiating of a contract between the Division of Conservation and Natural Resources and the Muskingum Conservancy District. This contract made available to sportsmen all hunting rights on 48,000 acres of land, all fishing rights on the 11 lakes owned by the District, and protected the

366 miles of shore lines of the lakes. Sportsmen are now reaping the benefits of this contract and it is recognized as one of the most outstanding conservation jobs ever done in Ohio, or in the nation.

The League and The Outdoor Writers

In the early 1930's, at a Chicago meeting of the Isaak Walton League, several members in attendance proposed that an organization of individuals writing "hunting and fishing" articles for the press should be formed. The first officers of the new outdoor writers organization were from Ohio and affiliated with the League of Ohio Sportsmen.

A few years later these same League individuals promoted a state organization of Ohio Outdoor writers. Both the Outdoor Writers Association of America and the Outdoor Writers of Ohio were the results of the concerted efforts of the closely affiliated officers of the League of Ohio Sportsmen.

A Major Achievement in Rehabilitation

It was during this era of the League's activities that a project of major importance to eastern and southern Ohio was brought into being. For several years ardent conservationists in southeastern Ohio were appalled at the havoc wrought in their counties by the strip mining of coal. Through the good offices of the League a meeting was arranged with the strip mine operators. The happy result of this meeting was the formation of the Ohio Reclamation Association--an enterprise carried on voluntarily by the strip mining industry to rehabilitate the marginal surface lands connected with the open-cut operations. The succeeding years have witnessed most gratifying results of the operations of this Association. Many of the unsightly spoil banks have been regraded and planted in food bearing plants, shrubs and grasses. Over 150 million trees have been planted. Many dams have been constructed across the final cuts in the operations, forming fishing lagoons, ponds and lakes. These waters are open to public fishing. Other reclaimed areas are leased to sportsmen's clubs for as little as one dollar a year. No better public relations endeavor in all Ohio has borne such success as has the volunteer operations of the members of the Ohio Reclamation Association.

The Fight Against Pollution

Over a long term of years the League fought for legislation to control and abate stream pollution. Despite powerful opposition it succeeded in 1941 to giving the then Department of Fish and Game the authority to prosecute for the killing of animal and vegetable life in our streams and lakes by pollution. The League alone played an influential part in the passage of the Deddens Act which, for the first time, set up a commission to control and prevent stream pollution by industries and municipalities. We are convinced that the influence of Ohio sportsmen, exercised through the League, contributed largely to the increased interest in the education of the public towards the menace of uncontrolled pollution.

Quail Reclassified

The League of Ohio Sportsmen bears the honored scars of many a legislative battle. One scar they carry to this day was caused by the alarming scarcity of quail in the early 1900's and the League's efforts to do something about it. The League proposed a two-year closed season on quail for both 1911 and 1913 but lost the fight when the Legislature voted in 1915 to place the quail on the song bird list. Corrective legislation has since been pressed by the League and resulted in a Quail Study Law being enacted in 1949. This law may yet make it possible for the large majority of bird hunters to enjoy their favorite sport since the law reclassifies the quail from a song bird to a game bird.

Field Trial Problems Eased

As the League continued to grow in size and influence it greatly expanded its activities. It interested itself in the problems of sporting dog owners who were finding it exceedingly difficult to hold their field trials on State-controlled areas. Thru the influence of the League, the original Field Trial Bill was introduced and enacted into law. In 1952, the League vigorously opposed three bills that were to be introduced into the Legislature which would have given control of field trials to the state, and for which the state would collect a fee for each day that the trials were run. Through League efforts these bills were never introduced.

Sandusky Bay

In 1954, the League called a meeting of statewide organizations to try to resolve the differences existing between the commercial fishermen, sports fishermen, and pleasure boat owners on Sandusky Bay. After many conferences, a satisfactory agreement was reached and unaminously approved.

In 1955, the bill resolving the differences was written, and after consultation with members of the General Assembly, was introduced and passed.

Foremost in the National Conservation Picture

The League was honored several years ago by being selected as the Ohio representative of the National Wildlife Federation. Since the League was admittedly the oldest and most active sportsmen's organization in Ohio there was no question as to the wisdom of the selection.

We are credited by many national organizations as having kept Ohio's members of Congress fully informed, at all times, on legislation concerning conservation (not only in Ohio, but of national importance) so that they could vote intelligently on such legislation.

Conservation Education

Under this heading comes the various activities engaged in by the League to promote conservation education among the youth of Ohio. To this end the League has cooperated whole heartily with the Future Farmers of America.

The League entered into the book publishing field in 1952 with its booklet "Adopt a Stream." This booklet, well written and handsomely illustrated, tells in detail how to improve or reclaim stream drainage areas by dams, riffles, pools, and contains a diagram for selected stream banks and area planting. This free booklet has been distributed in every state in the Union and in several foreign countries.

Another aspect of conservation education recently engaged in by the League is the distribution of wildlife and conservation books to all Ohio's public and parochial schools.The purchase of these books is by voluntary contributions from the clubs affiliated with the League. To date, almost 9000 books have been purchased and distributed. It is gratifying to see this worthwhile program of conservation education growing by leaps and bounds--it is more gratifying to read the thousands of letters that have been received from the recipients of the books. The League is genuinely proud of its member clubs who have made this program possible.

League Pioneers Gun Safety in Ohio

The League was the first sportsmen's organization in Ohio to realize the importance of teaching gun-safety to younger hunters---and they did something about it. They sponsored and introduced the National Rifle Association's "Hunter-Safety Program" in 1953 and organized schools and classes. In 1956, this worthwhile program was turned over to the Division of Wildlife, Department of Natural Resources, who will conduct future schools in hunter-safety.

Brotherhood of the Jungle Cock

For over 15 years the League has been the official sponsor of the Brotherhood of the Jungle Cock in Ohio. The Brotherhood, an international organization, is aimed at the youth of all countries and is primarily devoted to teaching sound sportsmanship. Any boy or girl, old enough to go fishing and recite the pledge of membership is welcomed into its ranks. The League has been honored by having one member of its executive committee elected to the presidency of the International Brotherhood of the Jungle Cock.

Legislative Victory

Also, in 1957, the League won a legislative victory when it defeated a bill designed to take away from conservation clubs the selling of hunting and fishing licenses. Also, that same year was initiated a state-wide project to encourage conservation clubs, fraternal organizations, farm granges and individual landowners to construct a lake, or lakes, in their area. This project would not only help solve the dwindling water table but would furnish one of the finest recreational assets any club or community could have. It is hoped that this project will be a lifetime project for all conservation clubs.

Quail Victory for Sportsmen

In 1959, a long, drawn-out battle dating from 1915 came to an end when the quail, previously classified as a song bird, was officially recognized as a game bird. League sponsored legislation now allows the hunting of quail on land owned by the State of Ohio and other lands where the Division of Wildlife, by lease or agreement, has the authority to manage the hunting and taking of game.

A Better and Bigger League

For many years, as its activities in the field of conservation education increased, and the burden of carrying on these and other programs in an effort to make Ohio more conservation minded, the League was always hard-pressed for lack of working capital to advance these endeavors. In 1960, was inaugurated an extensive campaign to secure sustaining members of the League from the ranks of industry, business and labor, and from others who had faith in the integrity and foresight of the large mass of sportsmen and conservationists within the League. In their desire to aid in the policies and the programs of the League these sustaining members, by their support, visibly improved the financial status of the League. An office has been set up in League headquarters at Columbus. It is assured now that more and better service will be available to all member clubs who have been the main support of the League of Ohio Sportsmen for the past 55 years.

Constitution Revised

Due to the rapid growth of the League and the many changes that have occurred in these modern times, it was thought advisable to amend and revise the League's Constitution and By-Laws to keep abreast of the changing trends in conservation and recreation. This was first accomplished in 1957 and again in 1963. The revised articles promise to make the League more efficient.

Target for Tomorrow

After many, long months of earnest study, almost endless conferences and diligent effort, the Chairman of the Policy and Program Committee submitted his completed report. It is, by its extensive coverage, a remarkable and extensive guide which is to be followed by the League for its future expansion and usefulness. No field of conservation, restoration, reclamation, recreation, education, pollution, contamination, or wildlife was overlooked. It gives to the League a definite target to be aimed at and a splendid goal to be achieved.

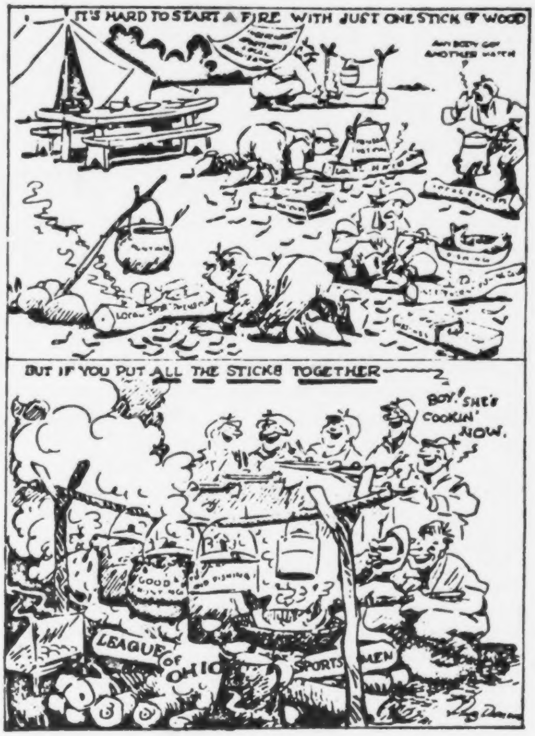
What Lies Ahead?

The officers and members of the League of Ohio Sportsmen are now engaged in carrying out the forceful programs which have made its name respected throughout the nation. But, while seeking new conservation and wildlife gains for the future, we must remain strong and united lest we lose all that we have won in the past.

June 1963

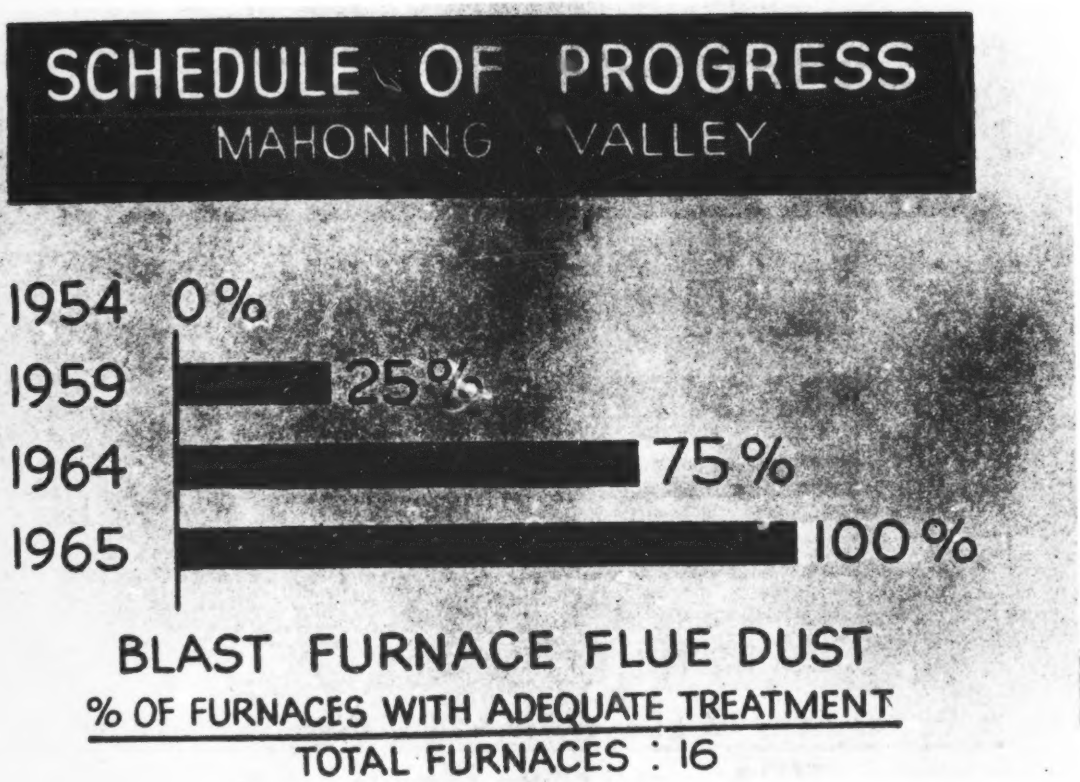
Jack Preble
Historian

"IN UNION THERE IS STRENGTH"


IT'S HARD TO START A FIRE WITH JUST ONE STICK OF WOOD
ANY BODY GOT ANOTHER MATCH
BUT IF YOU PUT ALL THE STICKS TOGETHER
BOY! SHE'S COOKIN' NOW.
GOOD HUNTING
GOOD FISHING
LEAGUE OF OHIO SPORTSMEN

"JOIN THE LEAGUE OF OHIO SPORTSMEN"

Reproduced from best available copy.

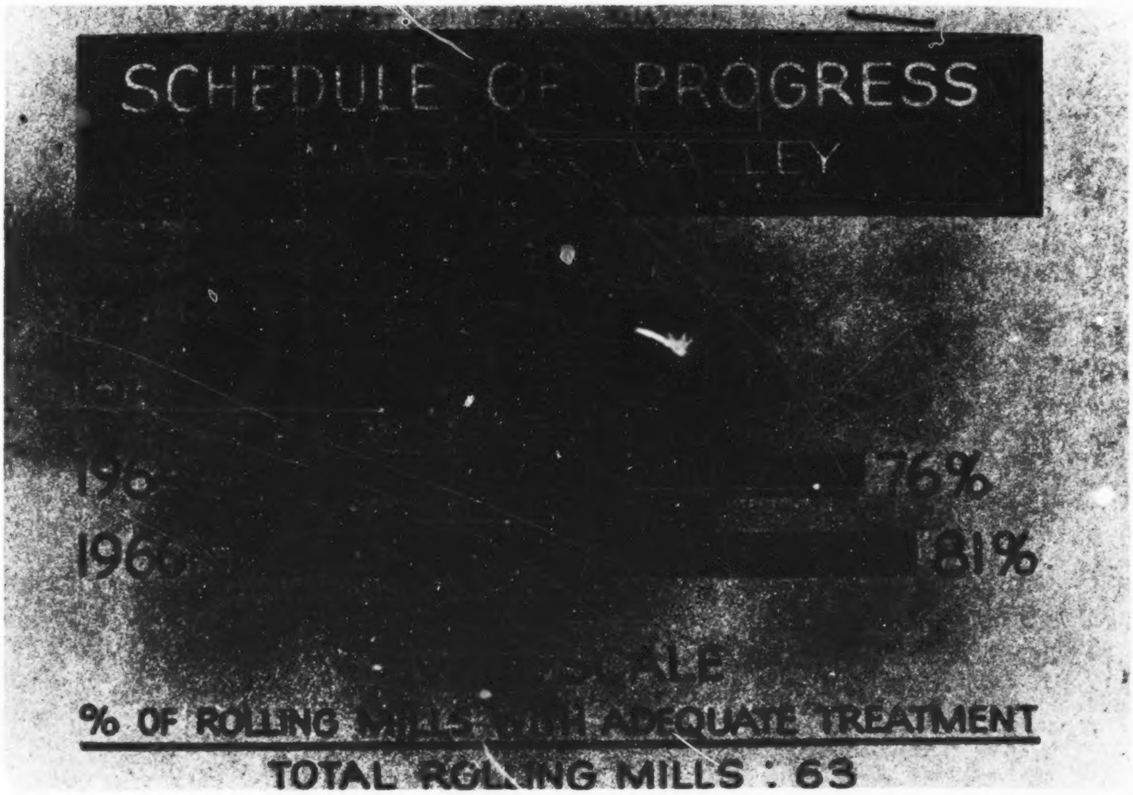


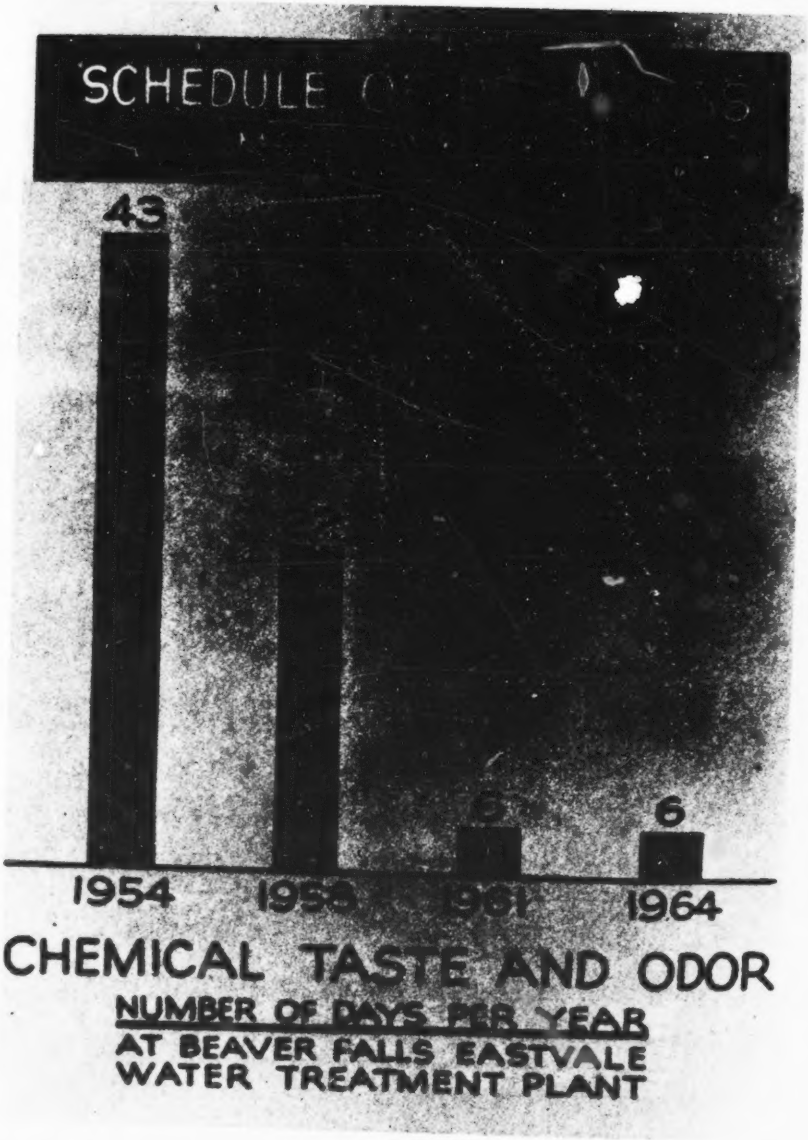
SCHEDULE OF PROGRESS
MAHONING VALLEY

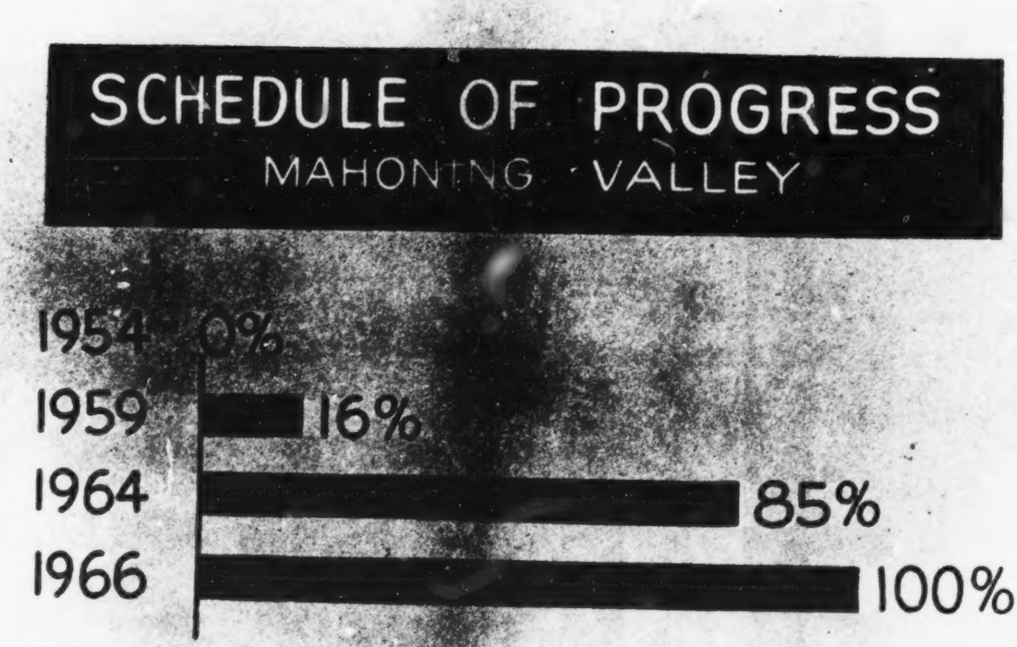
BLAST FURNACE FLUE DUST

% OF FURNACES WITH ADEQUATE TREATMENT

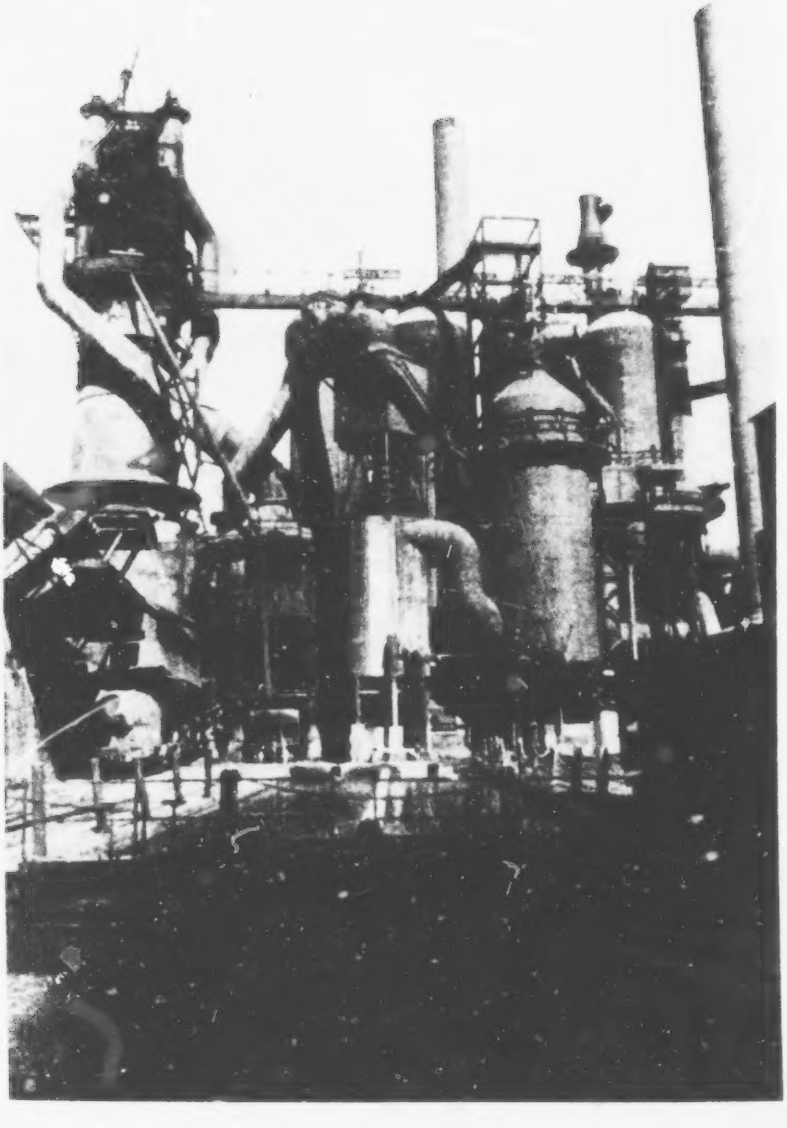
TOTAL FURNACES : 16

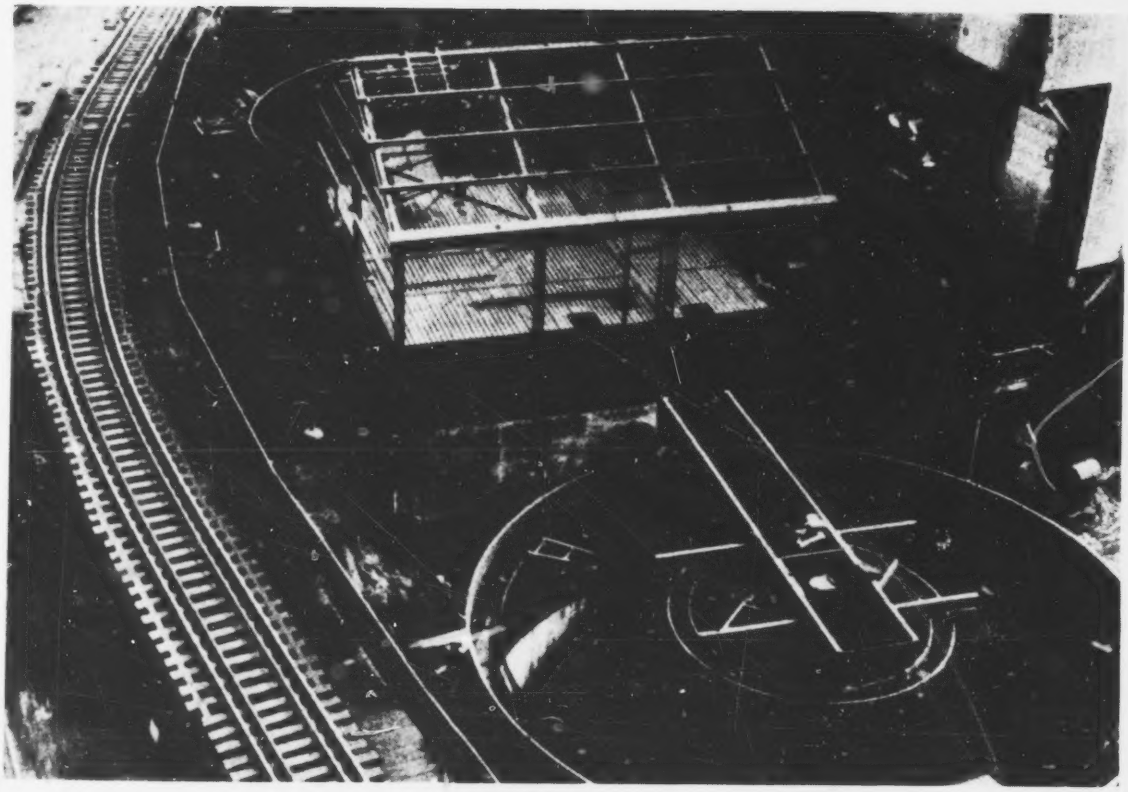

SCHEDULE OF PROGRESS
VALLEY
196
76%
196
81%
SCALE
% OF ROLLING MILLS WITH ADEQUATE TREATMENT
TOTAL ROLLING MILLS : 63


SCHEDULE O
5
43
6
6
1954
1958
1961
1964
CHEMICAL TASTE AND ODOR
NUMBER OF DAYS PER YEAR
AT BEAVER FALLS EASTVALE
WATER TREATMENT PLANT



SEWAGE FROM STEELMILL POPULATION (35,000)
% COLLECTED AND CONNECTED TO TREATMENT FACILITIES





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